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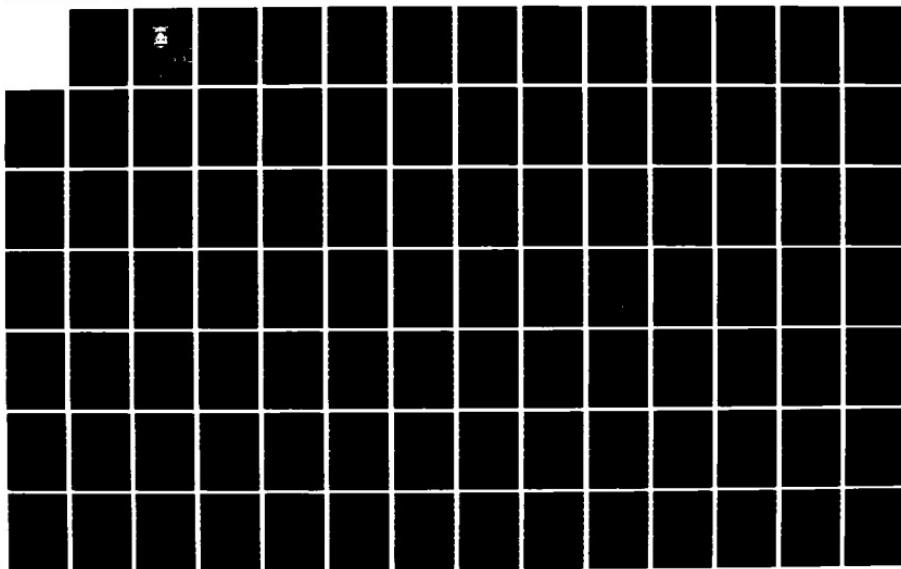
PRODUCTIVITY REVIEW AND ANALYSIS OF DIRECTORATE OF  
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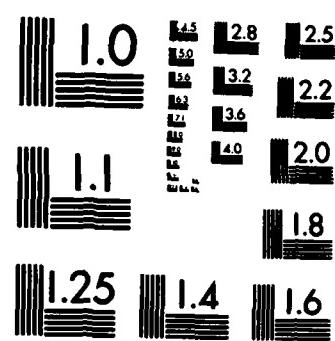
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PRODUCTIVITY REVIEW AND ANALYSIS  
DIRECTORATE OF ENGINEERING AND HOUSING  
BAUMHOLDER MILITARY COMMUNITY

AD-A150 937



PREPARED FOR:  
U.S. ARMY  
INSTALLATION SUPPORT ACTIVITY  
EUROPE

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PREPARED BY:  
E.L. HAMM & ASSOCIATES, INC.  
5701-A PRINCESS ANNE ROAD  
VIRGINIA BEACH, VIRGINIA 23462

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PRODUCTIVITY REVIEW  
OF  
DIRECTORATE OF ENGINEERING AND HOUSING  
AT  
U.S. MILITARY COMMUNITY BAUMHOLDER, F.R.G.

\* \* \* EXECUTIVE SUMMARY \* \* \*

PRODUCTIVITY REVIEW  
OF  
DIRECTORATE OF ENGINEERING AND HOUSING  
AT  
U.S. MILITARY COMMUNITY BAUMHOLDER, F.R.G.

\* \* \* EXECUTIVE SUMMARY \* \* \*

1.0 BACKGROUND

At the direction of the U.S. Army Installation Support Activity, Europe (USAISAE) a productivity review and management enhancement study of the Directorate of Engineering and Housing at the U.S. Military Community Baumholder was performed by E. L. HAMM & ASSOCIATES, INC., Virginia Beach, Virginia, during the months of July through September 1984.

2.0 OBJECTIVE

The objective of this study is to provide a comprehensive review of the Directorate of Engineering and Housing at the U.S. Military Community Baumholder and to make recommendations, both tangible and intangible, that will increase productivity and ensure the maximum effectiveness of the Real Property Maintenance Activity (RPMA) expenditures at Baumholder. Accomplishment of the foregoing objective will assist the Directorate of Engineering and Housing in providing the necessary support to the community and specifically the units attached to Baumholder. This support will enhance the mission of the community through a state of readiness and by keeping the morale of the soldier and his family high.

3.0 APPROACH

The approach used in carrying out this productivity review was:

- Conduct inbrief with United States Army Installation Support Activity, Europe (USAISAE) and representatives from the Schweinfurt, Baumholder and Karlsruhe communities.

- Conduct a three week on-site visit at Baumholder to gather data.
- Conduct preliminary analysis of collected data and identify potential adjustments and savings.
- Revisit the U.S. Military Community Baumholder for one week to gather additional data.
- Analyze data from other RPMA's to determine relative standing in control of work requirements and find areas of potential increased productivity.
- Compare data gathered and analyzed with data gathered and analyzed from other RPMA's.
- Complete analysis of data and develop a draft report.
- Upon receipt of comments from USAISAE, develop a final comprehensive report.

Prior to commencing the on-site data collection, E. L. HAMM & ASSOCIATES conducted a briefing with the Division Chiefs of the Directorate of Engineering and Housing (DEH) and separate briefings for the workforce. During the on-site visit, a briefing was also presented to the Military Community Deputy Commander. After the DEH briefings, E. L. HAMM & ASSOCIATES project personnel proceeded to inspect the in-house procedures and DEH management systems as well as beginning the work sampling phase of the study. Information gathered during other productivity studies was used as a base for comparison when appropriate. Workload and job/task assignment data was collected and analyzed with the goal of identifying areas of potential increased productivity. Extensive interviews with management and selected shop personnel were conducted to insure E. L. HAMM & ASSOCIATES not only understood the workload requirements, but also comprehended any constraints imposed due to regulations or local custom that could effect productivity.

#### **4.0 SUMMARY OF MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

A detailed review of current operations and available data from Fiscal Year (FY) 84 resulted in numerous findings, conclusions and recommendations, the major points of which are summarized on the following pages.

- The calculated productive, indirect productive, and nonproductive percentages for the Directorate of Engineering and Housing during the period observed were:

	<u>Productive</u>	<u>Indirect Productive</u>	<u>Non-Productive</u>	<u>Total</u>
Percentage	55.0	32.0	13.0	100.0
Time per Day	4 h 24 m	2 h 34 m	1 h 02 m	8 h 0 m

Stated in lay terms, the confidence interval is 99.73% (3 standard deviations) or the chances are approximately 9,973 out of 10,000 that the productive, indirect productive and nonproductive percentages are within the following confidence limits:

<u>Productive</u>	<u>Indirect Productive</u>	<u>Non-Productive</u>
54.5-55.5%	31.6-32.4%	12.9-13.1%

- E. L. HAMM & ASSOCIATES recommends the DEH at Baumholder make several changes (contained in Sections III and V of this report). Some of the recommendations are tangible and some intangible. Those that can be quantified create the following recommended percentage as goals.

	<u>Productive</u>	<u>Indirect Productive</u>	<u>Non-Productive</u>
Percentage	62.6	26.2	11.2
Time per Day	5 h 0 m	2 h 06 m	0 h 54 m

The increase in productivity represents an increase of 7.6% or 36 minutes per day per craftsperson, a total savings of \$157,874 or 32,285 person-hours per year.

- The general lack of anticipating what tools normally would be required at a job, and putting away and getting tools before and after lunch is costing the DEH 11 to 12 minutes per day per craftsperson or \$49,855 each year.

- The heavy work site cleanup requirement is costing the DEH about 4 minutes per day per craftsperson on \$18,696 each year.
- The practice of returning to the shop for lunch is costing the DEH 12 minutes per day per craftsperson or \$51,932 each year.
- The worker having to wait for transportation and work assignments is costing the DEH about 8 minutes per day per craftsperson or \$37,391 each year.
- Sick leave taken during a recent 12 month period exceeded the U.S. Army, Europe (USAREUR) goal (5 percent) by 29,929 hours. Reducing sick leave to the USAREUR goal will result in a per annum cost avoidance of \$268,278.
- IJO variance analysis is not being used to the fullest extent. Accuracy of reporting work performance is questionable in that significant amounts of work reported are greater than +/- 10% of the estimate and exactly as estimated. Recommended preparation of a monthly variance analysis summary to be used as a tool for shop and P&E performance improvement.
- The scheduling process is inefficient as currently structured. The proper assembly of information is paramount to the production of an executable schedule. An orderly schedule meeting and adherence to the DEH approved schedule will result in higher productivity at the community. Recommend that the Director of Deputy Director be involved in the weekly schedule process and the authority to change the schedule be limited to the Director, Deputy, and the Chief ERMD.
- Inadequate vehicle resources are primary contributors to low worker productivity in accomplishing Service Order and Individual Job Order work. Recommend an additional 29 vehicles be allocated to the DEH to support the single-worker SO Teams and the IJO workers. The total cost for these vehicles over their economic life (6 years) is \$321,726 or a per annum cost of \$53,621.
- Management of service order work is being accomplished by overmanned SO Teams with insufficient work to keep the craftsperson fully productive. Frequent return trips to the shop for material and additional work were observed. Recommend scheduling less SO hours to increase the Shop SO backlog and implement the single-worker SO Team. The team should be assigned a full days work which when properly planned will increase productivity. The additional per annum IJO hours resulting from the scheduling of less SO hours is 44,640. The net value of additional IJO work is \$477,069 (gross IJO cost \$530,690 minus per annum vehicle costs \$53,621).

- Limited use of the management information, available in various forms, is being made by DEH management personnel. Recommend that management information be presented monthly to assist DEH managers to gauge efficiency and effectiveness of the DEH organization.
- The Preventive Maintenance system presently used is neither efficient nor effective. Significant amounts of self-help work not requiring journeyman-level craftpersons are being accomplished. Team composition is not efficient. Recommend reorganizing the regular PM Teams to a two man maintenance mechanic concept which will result in a net per annum savings of \$72,163.
- A recap of potential cost avoidance is shown below:

- Increase Productivity to 62.6%	\$157,874
- Eliminate Excess Sick Leave	268,278
- Additional IJO Hours Cost	477,069
TOTAL PROJECTED COST AVOIDANCE	\$903,221

## SECTION I

### \* \* \* INTRODUCTION \* \* \*

#### 1.0 BACKGROUND

E. L. HAMM & ASSOCIATES, INC. (hereinafter referred to as HAMM ASSOCIATES) has been contracted to conduct a productivity review and analysis of the Baumholder Military Community Directorate of Engineering and Housing (DEH) under contract number DACA65-84-C-0111.

#### 1.1 Purpose

The purpose of the productivity review and analysis is to provide recommendations for tangible improvements, without increased manpower, that are cost effective and ensure maximum effectiveness of Real Property Maintenance Activity (RPMA) expenditures.

#### 1.2 Approach

The approach used in carrying out this productivity review and analysis was to:

- Initially meet with all interested parties to ensure mutual understanding of the review objectives and processes.
- Gather data through work sampling procedures.
- Review the organization, staffing, workload and information flow of the DEH.
- Conduct preliminary analysis of data and identify areas of potential increased productivity and dollar savings.
- Revisit the Baumholder Military Community to verify and expand on data previously collected, where required.
- Use comparative analysis of data from other productivity review, when applicable.
- Complete analysis of data and develop a draft report.
- Upon receipt of comments from the Government, develop a final comprehensive report to include an Executive Summary.

The techniques and methods used to accomplish the productivity review and analysis include:

- Intensive Work Sampling
- Comparative Analysis
- Soliciting of Expert Opinion
- Review of Historical Data
- Informal Interviews
- General Observations

Maintenance and repair (M&R) activities are labor intensive and represent a substantial portion of the DEH budget. M&R, when accomplished with in-house resources, is accomplished by the Buildings and Grounds and Utilities Divisions. Accordingly, heavy emphasis was placed on the mobile blue collar work force in these divisions during HAMM ASSOCIATES' review and analysis while at the same time reviewing those additional areas specified in the contract scope of work with the exception of the Housing Division and the Fire Prevention and Protection Division. The Deputy Community Commander stated he was satisfied with the Housing Division operation and did not desire a review. The Chief of the Engineer Resources Management Division stated there was no need to review the Fire Prevention and Protection Division. Recommendations are made which will increase shop productivity through changes in shop procedures. Additional productivity improvements, however, must be realized through improved management of the work processes and optimizing shop support by overhead organizations (primarily Supply and ERMD).

Prior to commencing the on-site data collection, HAMM ASSOCIATES conducted a briefing for the Facilities Engineer and key DEH management personnel. During the briefing, the purpose and the processes to be used in conducting the review and analysis were discussed. Subsequent briefings were provided to the blue collar workforce.

## SECTION II

### WORK SAMPLING

\* \* \* STATISTICAL ANALYSIS \* \* \*

#### 2.0 INTRODUCTION

A work sampling study was conducted of the Baumholder shops during July, 1984 as part of this Productivity Review and Analysis. HAMM ASSOCIATES personnel made detailed observations of the activity of craftspersons in the following work centers:

- 01 Carpentry
- 02 Electric
- 03 Plumbing
- 04 Sheetmetal
- 05 Paint
- 06 Refrigeration/Air Conditioning/Kitchen Equipment
- 07 Roads
- 08 Grounds
- 10 Preventive Maintenance
- 13 Water Systems Maint.
- 14 Sewage Systems Maint.
- 16 Masonry
- 17 Roofing
- 19 Steamfitting
- 21 Entomology

The statistical results of the collective study are presented in Appendix A beginning on page II-11 of this section.

## 2.1 Objectives

Work sampling is designed in part to measure the productive effort of the blue collar workforce in the shops. As a result of the sampling, specific factors adversely affecting productivity are clearly identified as problem areas. The statistics gathered in this study do not reflect the true performance level of the craftspersons observed during productive time. Engineered Performance Standards coupled with stopwatch time studies or other methods of advanced estimating of work accomplishment must be used to more accurately determine the craftsperson's performance. Instead, these percentages show, within mathematically defined limits and at a mathematically defined probability, how much of the craftsperson's time is productive, indirect productive, and non-productive.

## 2.2 Work Sampling Methodology

Work sampling is a work measurement technique that requires direct observation of the work, but does not require a stopwatch or timing device. It is a statistical technique that is based on binomial distribution and sampling at random or on a predetermined fixed interval. It consists of taking a number of intermittent and instantaneous observations of an activity and from these observations determining the percentage of time devoted to each category. If an adequate number of observations are taken, this percentage can be considered accurate.

The system of work sampling chosen for this study is the High Frequency Method as described in Chapter 3, Section 5 of the Army Technical Bulletin 420-1 Engineers Manual.

This method was selected over the Random Route Method or the Fixed Route Method described in TB 420-1 because of the difficulty in prelocating either jobs or craftspersons for observation as is required for these two methods.

The High Frequency Method consists of taking a series of instantaneous observations every two minutes over a full eight hour period. An equal number of morning and afternoon periods are sampled to ensure that the sampling team observes a representative portion of the various classifications of activities described in the remainder of this section of the study.

### 2.3 Summary of Results

Overall, the shops sampled were 55.0% productive, 32.0% indirect productive, and 13.0% non-productive. Table II-1, is a brief summary of the results together with definitions of the three basic categories. Table II-2 shows the mathematical computations. Table II-3, breaks down the observations and percent by shop. Table II-4 is the computation of percentages for Productive, Indirect Productive and Nonproductive. Table II-5 is the computation of relative precision. Table II-6, shows the shop ranking by category from the most to the least desirable results. Table II-7, shows relative findings at other Army Real Property Maintenance Activities surveyed by HAMM ASSOCIATES and is included for information/comparison purposes only. Exhibits II-1 through II-3, are graphical displays of the three major categories by shop of the data from Table II-3.

TABLE II-1  
 SUMMARY  
BAUMHOLDER MILITARY COMMUNITY

	<u>Productive</u>	<u>Indirect Productive</u>	<u>Non-Productive</u>
Percent	55.0%	32.0%	13.0%
Time Per Day	4 h 24 m	2 h 34 m	1 h 02 m

Stated in mathematical terms, the confidence interval is 99.73% (3 standard deviations) or the chances are 9,973 out of 10,000 that the Productive, Indirect Productive, and Non-productive times are within the following confidence limits:

<u>PRODUCTIVE</u>	<u>INDIRECT PRODUCTIVE</u>	<u>NON-PRODUCTIVE</u>
54.5% - 55.5%	31.6% - 32.4%	12.9% - 13.1%

#### Definitions

- Productive - Any activity which contributes directly to altering the composition, condition, conformation, or construction of the item or area being repaired or altered.
- Indirect Productive - Any activity performed that renders assistance or preparation for the productive portion of a task. It is necessary or required work that does not alter the composition, condition, conformation or construction of an item.
- Non-Productive - Idle time due to circumstances either controllable or uncontrollable by the Directorate of Engineering that does not contribute directly or indirectly to the accomplishment of a craft task.

TABLE II-2  
COMPUTATION OF MAJOR CATEGORIES  
STATISTICAL SUMMARY  
U.S. MILITARY COMMUNITY BAUMHOLDER

- Percentages for Productive, Indirect Productive and Non-Productive categories, Relative Precision, and Confidence Limits are computed using the following equations:

$$\bar{P}_k = \frac{\sum f_i P_{ik}}{\sum f_i} \quad \sigma_p^2 = \frac{\sum \frac{f_i^2 (P_i)(1-P_i)}{n_i}}{(\sum f_i)^2} \quad CL = \bar{P}_k \pm (\bar{\sigma}_p)(z)(\bar{P}_k)$$

where:

$k$	=	Productive ( $p$ ), Indirect Productive ( $ip$ ), or Nonproductive ( $np$ )
$\bar{P}_k$	=	DEH percentage for category $k$
$f_i$	=	Number of personnel in shop $i$ who could have been sampled. (Shop strength less foreman, clerks, etc.)
$x_i$	=	Number of observations by category $k$ in shop $i$
$n_i$	=	Total observations in shop $i$
$P_{ik}$	=	Computed percentage of category $k$ in shop $i$ = $x_i/n_i$ .
$\sigma_p$	=	Standard deviation.
$P_i$	=	Computed percentage in shop $i$ y category $k$
$CL$	=	Confidence Limits
$z$	=	Confidence interval is 99.73% (3 standard deviations)

- Percentage calculations (see Tables II-3 and 4 for shop calculations).

<u>PRODUCTIVE</u>	<u>INDIRECT PRODUCTIVE</u>	<u>NON-PRODUCTIVE</u>
$\bar{P}_{kp} = \frac{13,259.0}{241} = 55.0\%$	$\bar{P}_{kip} = \frac{7,718.8}{241} = 32.0\%$	$\bar{P}_{knp} = \frac{3,122.2}{241} = 13.0\%$

- Relative Precision and Confidence Limit calculations (see Tables II-3 and 5 for shop calculations)

<u>PRODUCTIVE</u>	<u>INDIRECT PRODUCTIVE</u>	<u>NON-PRODUCTIVE</u>
$\bar{\sigma}_p^2 = \frac{.485}{58081} = .0000084$	$\bar{\sigma}_p^2 = \frac{.786}{58081} = .0000135$	$\bar{\sigma}_p^2 = \frac{.472}{58081} = .0000081$
$\bar{\sigma}_p = .0029$	$\bar{\sigma}_p = .0037$	$\bar{\sigma}_p = .0029$

Confidence Limits with 99.73% Confidence Level.

Productive	$CL = .550 + (.0029)(3)(.550) = 54.5\% \text{ to } 55.5\%$
Indirect Productive	$CL = .320 \pm (.0037)(3)(.320) = 31.6\% \text{ to } 32.4\%$
Nonproductive	$CL = .130 \pm (.0029)(3)(.130) = 12.9\% \text{ to } 13.1\%$

TABLE II-3  
SUMMARY OF OBSERVATIONS  
AND PERCENT BY SHOP

SHOP	Persons <u>f<sub>i</sub></u>	PRODUCTIVE		INDIRECT PRODUCTIVE		NON- PRODUCTIVE		TOTAL <u>OBS n<sub>i</sub></u>
		Kp	% <u>p<sub>i</sub></u>	Kip	% <u>p<sub>i</sub></u>	Knp	% <u>p<sub>i</sub></u>	
01 Carpentry	15	51.0	856	34.1	574	14.9	250	1680
02 Electric	22	48.8	1054	49.7	879	10.5	227	2160
03 Plumbing	8	39.5	383	46.2	448	14.3	139	970
04 Sheet Metal	16	46.3	1111	38.2	917	15.5	372	2400
05 Paint	12	71.6	1200	20.6	334	7.8	131	1675
06 Kitchen	12	61.1	877	27.9	400	11.0	158	1435
07 Roads	15	59.3	507	30.8	263	9.9	85	855
08 Grounds	41	60.0	639	23.8	253	16.2	173	1065
10 Preventive Maintenance	31	55.5	999	26.1	469	18.4	332	1800
13 Water Maint.	7	50.4	242	41.5	199	8.1	39	480
14 Sewage Maint.	8	36.1	231	55.6	356	8.3	53	640
16 Masonry	17	54.5	1228	37.6	848	7.9	179	2255
17 Roofing	5	57.7	277	35.8	172	6.5	31	480
19 Steamfitting	26	62.8	992	25.4	402	11.8	186	1580
21 Pest Control	<u>6</u>	<u>35.3</u>	<u>339</u>	<u>48.3</u>	<u>464</u>	<u>16.3</u>	<u>157</u>	<u>960</u>
TOTAL	241		10,935		6,988		2,512	20,435

TABLE II-4  
COMPUTATION OF PERCENTAGES  
FOR PRODUCTIVE, INDIRECT PRODUCTIVE AND NONPRODUCTIVE

SHOP	PERSONS	PRODUCTIVE	INDIRECT PRODUCTIVE	NON- PRODUCTIVE
		<u>f<sub>i</sub></u>	<u>f<sub>i</sub>P<sub>ikp</sub></u>	<u>f<sub>i</sub>P<sub>ikip</sub></u>
01 Carpentry	15	765.0	511.5	223.5
02 Electrical	22	1073.6	895.4	231.0
03 Plumbing	8	316.0	369.6	114.4
04 Metal	16	740.8	611.2	248.0
05 Paint	12	859.2	247.2	93.6
06 Refrigeration/ Kitchen	12	733.2	334.8	132.0
07 Roads	15	889.5	460.5	150.0
08 Grounds	41	2460.0	975.8	664.2
10 Preventive Maintenance	31	1720.5	809.1	570.4
13 Water Maint.	7	352.8	290.1	56.7
14 Sewage Maint.	8	288.8	444.8	66.4
16 Masonry	17	926.5	639.2	134.3
17 Roofing	5	288.5	179.0	32.5
19 Steamfitting	26	1632.8	660.4	306.8
21 Entomology	<u>6</u>	<u>211.8</u>	<u>289.8</u>	<u>98.4</u>
	$\Sigma f_i = 241$	13259.0	7718.8	3122.2

$$\bar{P}_k = \frac{\sum f_i p_{ik}}{\sum f_i} = \frac{13,259.0}{241} = 55.0\% \quad \frac{7,718.8}{241} = 32.0\% \quad \frac{3,122.2}{241} = 13.0\%$$

TABLE II-5  
COMPUTATION OF RELATIVE PRECISION

SHOP	PERSONS	PRODUCTIVE	INDIRECT PRODUCTIVE	NON- PRODUCTIVE
		$\frac{f_i}{n_{ip}}$	$\frac{(f_i)^2(p_i)(1-p_i)}{n_{ip}}$	$\frac{(f_i)^2(p_i)(1-p_i)}{n_{inp}}$
01 Carpentry	15	.033	.030	.017
02 Electrical	22	.056	.054	.021
03 Plumbing	8	.016	.016	.008
04 Metal	16	.027	.025	.014
05 Paint	12	.017	.014	.006
06 Refrigeration/ Kitchen	12	.024	.020	.010
07 Roads	15	.064	.056	.024
08 Grounds	41	.009	.286	.214
10 Preventive Maintenance	31	.132	.103	.080
13 Water Maint.	7	.026	.025	.008
14 Sewage Maint.	8	.023	.025	.008
16 Masonry	17	.032	.030	.009
17 Roofing	5	.013	.012	.003
19 Steamfitting	26	.004	.081	.045
21 Entomology	<u>6</u>	<u>.009</u>	<u>.009</u>	<u>.005</u>
	$\Sigma f_i = 241$	.485	.786	.472

$$(\Sigma f_i)^2 = 58081$$

$$\sigma_p^{-2} = \frac{\sum \frac{f_i^2(p_i)(1-p_i)}{n_i}}{(\Sigma f_i)^2}$$

$$\bar{\sigma_p} = (\sigma_p^{-2})^{\frac{1}{2}}$$

$$\bar{\sigma_p} = .0000084 \quad \bar{\sigma_p} = .0000135 \quad \bar{\sigma_p} = .0000081$$

$$\bar{\sigma_p} = .0029 \quad \bar{\sigma_p} = .0037 \quad \bar{\sigma_p} = .0029$$

TABLE II-6  
SHOP RANKING BY CATEGORY

<u>PRODUCTIVE</u>		<u>INDIRECT PRODUCTIVE</u>		<u>NON-PRODUCTIVE</u>	
05 Paint	71.6%	05 Paint	20.6%	17 Roofing	6.5%
19 Steamfitting	62.8%	08 Grounds	23.8%	05 Paint	7.8%
06 R/AC/Kit Equip.	61.1%	19 Steamfitting	25.4%	16 Masonry	7.9%
08 Grounds	60.0%	10 PM	25.6%	13 Water Maint.	8.1%
07 Roads	59.3%	06 R/AC/Kit Equip.	27.9%	14 Sewage Maint.	8.3%
17 Roofing	57.7%	07 Roads	30.7%	07 Roads	10.0%
10 PM	55.8%	01 Carpentry	34.1%	02 Electric	10.5%
16 Masonry	54.5%	17 Roofing	35.8%	06 R/AC/Kit Equip.	11.0%
01 Carpentry	51.0%	16 Masonry	37.6%	19 Steamfitting	11.8%
13 Water Maint.	50.4%	04 Sheet Metal	38.2%	03 Plumbing	14.3%
02 Electric	48.8%	02 Electric	40.7%	01 Carpentry	14.9%
04 Sheet Metal	46.3%	13 Water Maint.	41.5%	04 Sheet Metal	15.5%
03 Plumbing	39.5%	03 Plumbing	46.2%	08 Grounds	16.2%
14 Sewage Maint.	36.1%	21 Pest Control	48.3%	21 Pest Control	16.4%
21 Pest Control	35.3%	14 Sewage Maint.	55.6%	10 PM	18.6%

TABLE II-7  
COMPARISON WITH OTHER ACTIVITIES  
CURRENT VERSUS RECOMMENDED PERCENTAGES

<u>FACILITY</u>	<u>PRODUCTIVE</u>		<u>INDIRECT PRODUCTIVE</u>		<u>NON PRODUCTIVE</u>	
	<u>CUR</u>	<u>REC</u>	<u>CUR</u>	<u>REC</u>	<u>CUR</u>	<u>REC</u>
A	62.6	65.0	23.6	21.2	13.8	13.8
B	47.0	61.9	35.8	27.8	17.2	10.3
C	40.7	59.8	33.8	24.8	25.5	15.4
D	41.0	60.0	26.6	26.6	32.4	13.4
E	44.8	60.0	40.0	27.0	15.2	13.0
F	46.9	60.0	40.7	27.6	12.4	12.4
G	52.4	66.9	32.8	20.6	14.8	12.5
H	38.3	60.0	26.2	25.4	35.5	14.6
I	48.6	62.8	33.9	24.2	18.0	13.0
J	47.2	60.0	28.7	27.6	24.1	12.4
K	40.7	59.0	35.9	24.8	23.4	16.2
L	47.2	62.8	37.4	23.7	15.4	13.5
M	42.4	60.0	31.2	27.6	26.5	12.4
N	46.1	61.1	39.4	26.2	14.5	12.7
O	44.8	59.6	31.8	21.6	23.4	18.8
Baumholder	55.0	62.6	32.0	26.2	13.0	11.2

APPENDIX A  
TO  
SECTION II

\* \* \* DETAILED ANALYSIS OF THE WORK SAMPLING STUDY \* \* \*

II.A DETAILED ANALYSIS OF THE WORK SAMPLING STUDY

II.A.1 100 Productive - 55.0%

(1) This category identifies that portion of the craftsperson's time that is applied directly to the performance of functions, the end result of which is the accomplishment of an assigned task.

(2) The statistical phase of this study does not reflect the true skill level and performance rate of the craftspersons observed. Engineered Performance Standards or other methods such as Stopwatch Time Studies, must be used to determine craftsperson's performance. What these percentages do show is that for approximately 4 hours and 24 minutes of the craftsperson's time each day, he is engaged in the performance of productive work. It is the conclusion of the work sampling team that the craftsperson's productivity can be increased by better time management and scheduling. Specific recommendations are contained in this Appendix and in Sections III, page III-1, and V, page V-1.

II.A.2 200 Indirect Productive - 32.0%

A. 210 Job Preparation - 11.1%

(1) This category identifies that portion of the craftsperson's time that is devoted to receiving instructions, getting necessary tools together at the beginning of the day or at the beginning of the job, and the time for cleaning tools and putting them away upon finishing the job or at the end of the day.

(2) The time the craftsman spent within each category is summarized in Table II-A-1 below.

TABLE II-A-1  
SUMMARY OF CRAFTSMAN'S TIME SPENT  
FOR  
JOB PREPARATION  
(Based on 8-Hour Work Day)

	<u>Minutes</u>	<u>Percent</u>
211 Receiving Instructions from Supervisor	6.7	1.4
212 Getting & Putting Away Tools & Equipment	6.2	1.3
213 Layout & Put Away Tools, Equipment, & Material at Job Site	26.4	5.5
214 Clean Up Job Site	11.0	2.3
215 Personal Clean Up at Job Site	2.0	0.4
216 Safety Precautions	<u>1.0</u>	<u>.2</u>
210 CATEGORY TOTAL	53.3	11.1

(3) The total time per day expended for job preparation, 53 minutes, is considered excessive. The major categories of concern are 213 (Layout and put away tools, equipment and material at job site), and 214 (Clean up job site).

(4) The most significant reasons for category 213 to be 26 minutes is the general lack of anticipating what tools would normally be required at the job site, and the putting away and getting out of tools before and after the lunch break. Craftsmen were observed leaving the truck with no tools and equipment, thus ensuring they would have to make a return trip to the truck before the job could be accomplished. Also on several occasions, the craftsman failed to carry along a normally required item (e.g., during one morning observation period, a

craftsman from the PM Shop was observed making extra trips while performing PM, to return to the truck for light bulbs; the craftsman initially carried no light bulbs into the building) (see Exhibit II-9, Examples A and C, pages II-34 and II-43).

The handling of tools includes the time expended going from the building to the truck and return. By anticipating the appropriate tools and equipment to carry initially, most of this motion would be eliminated. By craftsmen eating lunch on the job site, the time normally expended handling tools before and after lunch break would be eliminated.

(5) While it is not practical to establish a specific amount of time for handling tools and equipment, it is determined that an average of 15 minutes a day or 3.1% is a reasonable goal based on several recent studies.

(6) The category 214 is slightly high at 11 minutes per day. This is due mainly to shops with heavy work site clean up requirements. It is concluded that this time can be reduced by utilizing the grounds personnel currently utilized to pick up litter on post. This will reduce the clean up time. 1.4% is considered a realistic and obtainable goal for clean up time. (See Exhibit II-9, Example B, page II-40, for example of above.)

#### B. 220 Material Handling - 1.5%

(1) Material handling consists of physically obtaining material, loading and unloading the truck and locating material to be obtained.

(2) The Material Handling time was 7 minutes per day. This time is considered reasonable.

C. 230 Travel Time - 12.5%

(1) Travel time for this study is the time expended by the craftsperson in checking out the vehicles in the morning, traveling to the job sites, traveling back and forth to the shop and returning to the shops for lunch and at night.

(2) The amount of travel time by craftpersons observed during the work sampling study averaged one hour per day. This time can be reduced.

The major factors contributing to excessive travel are listed below in order of magnitude. These comments are general. They do not apply equally to all shops.

- Improper planning, scheduling and supervision on the part of the foremen. This results in unnecessary trips back and forth between the shops and the various job sites. It also results in craftpersons selecting the work they desire to do and the order in which to do it. It has also been observed, over and over, at other RPMA's that the craftpersons assigned service orders leave the shop without enough work to keep them fully occupied. The result is several trips per day back to the shop looking for more work. Craftpersons were observed returning to the shops, picking up one SO, returning to the shop, picking up another SO and returning to the same area. This practice also results in the excessive use of gasoline. Examples of these situations are contained in Exhibits II-9, D thru F, pages II-47 thru II-61. Craftsmen were also observed stretching out work. (See also Section III, page III-13, for further discussion on SO work management.)
- The Practice of Craftpersons Returning to the Shops for Lunch Results in Lost Productivity. In several cases observed during the work sampling, craftpersons returned to the shop for lunch in spite of the DEH policy not to do so. Examples of this situation are contained in Exhibits II-9 A and G, pages II-34 and II-62. Interviews with 14 firms in the Tidewater, Virginia area resulted in the finding that none of them allowed craftpersons to return to the shop for lunch on a routine basis. The business firms interviewed included:

	<u>Number</u>
Air Conditioning & Refrigeration/Heating	4
Carpentry	2
Electrical	3
Plumbing	3
Painting	1
General Construction	1
TOTAL	<b>14</b>

The practice was to either eat on the job or at a nearby establishment. Also in 13 of the 14 cases, no fixed lunch hour was assigned. This increased productivity in that the lunch time was taken between jobs. Craftspersons were observed to stop work, put away tools and equipment, return to the shop for lunch, drive back to the work site, break out tools and equipment, and then start to work on the same job again. At Fort Sill, verified by work sampling in July 1982, the policy is to eat on the job site. The high productive time observed at Fort Sill was in large part due to this efficient practice.

- Inadequate vehicle support. During work sampling it was observed that most shops did not have a sufficient amount of vehicles to avoid sending two craftsmen on one craftsman jobs. Many times workers were dropped off at various job sites by a craftsman, thus causing the craftsman driving to travel much of the day rather than perform productive work. (See Section V, page V-7, for a detailed discussion of vehicle support.)

(3) The above recommendations should assist in eliminating unnecessary travel, it is determined that 10% or 48 minutes is a reasonable goal. NOTE: DEH remote areas were not included in the percentages, only areas within a 10 mile radius were used.

#### D. 240 Planning On the Job Site - 2.4%

(1) This category identifies that phase of the job preparation devoted to obtaining an understanding of job requirements planning (job site), and is usually the responsibility of the craftsman assigned to the specific job.

(2) Job site planning consists of studying the job site, reading drawings and sketches, making calculations, and discussing the job with other craftspersons. This planning consumed an average of

approximately 12 minutes per day. On-site observations indicate the time spent was valid and the planning could not have been accomplished more economically by any other individual. It is stressed that the contact person's telephone number must be on all IJ0s and SOs to prevent lost time and reduced productivity. It is unproductive when a craftsperson must search for a contact.

E. 250 Balancing Delay - 2.2%

(1) This category reflects that portion of time during multi-person jobs when one craftsperson's productive effort is halted by the supporting efforts of another.

(2) The time per day, 11 minutes, results largely from the type of work being performed and is considered reasonable.

F. 260 Maintenance of Shop Tools and Equipment; 270 Housekeeping - 1.5%; 0.1%

(1) These categories reflect: (a) the time used by craftspersons to assure tools and equipment are functional, (b) required time to perform necessary in-shop cleanup, and (c) time expended in fueling vehicles.

(2) These categories are acceptable.

G. 290 Paperwork - 0.7%

(1) This category includes the time craftspersons spend preparing issue slips for material being withdrawn from the warehouse, preparing time sheets, recording work done on SOs, listing materials used on the job, etc.

(2) The time per day, about 3 minutes, is considered acceptable.

II.A.3 300 NONPRODUCTIVE - 13.0%

A. 310 Personal - 8.6%

(1) This category identifies that time required to satisfy normal personal needs. Included in this category is the time required for clean-up and dressing, washroom, coffee breaks, and rest periods.

TABLE II-A-2  
SUMMARY OF CRAFTSPERSON'S TIME SPENT FOR PERSONAL TIME

		<u>Percent</u>	<u>Average Minutes Per Day</u>
311	Latrine	0.3	1
312	Idle (Productive Work Available)	4.2	20
313	Clean Up and Dressing	0.4	2
314	Coffee Breaks and Rest Periods	<u>3.7</u>	<u>18</u>
			8.6
			41

(2) This study shows an average of 41 minutes per day in this category. This time is well within acceptable limits. In fact in several cases workers observed did not stop for their allotted 10 minute breaks in the morning or afternoon.

B. 320 Official Temporary Absence from Job - 0%

(1) This category identifies that time expended on meetings, blood donations, physicals and other administrative requirements.

(2) No activity in this category was observed.

C. 330 Idle - (Not Controlled by Craftsperson, But Controlled by DEH - 3.8%

(1) This category covers that portion of time spent by the craftsperson resulting from factors that are not under the control of the

craftsperson, but are under the control of the DEH. Exhibit II-9 F thru I, pages II-57 thru II-72, illustrate examples of this situation. Table II-A-3 presents the 330 category and its subcategories.

TABLE II-A-3  
SUMMARY OF IDLE TIME (NOT CONTROLLED BY CRAFTSPERSON)

<u>CODE</u>	<u>DESCRIPTION</u>	<u>PERCENT</u>	<u>MINUTES PER DAY</u>
331	Await Transportation	.6	3
332	Await Assignment	1.0	5
333	Await Tools or Materials	.7	3
334	Two persons on a one person job/poor scheduling	<u>1.5</u>	<u>7</u>
		3.8	18

(2) The time of 18 minutes per day is slightly excessive and is due primarily to the lack of trucks, lack of planning and supervision on the part of Foremen and/or the lack of workload in the shops. The following specific recommendations are made:

- The DEH should further analyze the cost benefit factor of obtaining new trucks versus sending two or more craftspersons on jobs that require one craftsperson. HAMM ASSOCIATES preliminary findings indicate that the additional hours made available would justify the additional trucks. (See Section V, page V-7.)
- For SOs the Foremen should plan work assignments in advance and schedule the work in sequence. Where necessary they should contact the activities in advance to ensure the activities supported are waiting when the craftspersons arrive.
- The Foremen should always assign enough work. On many occasions craftspersons are observed running out of work and returning for more work. (See Section III, page III-13.)
- More emphasis and control are needed to increase the amount of IJO work being performed. Also realistic times for SOs should be established and adhered to. (See Section III, page III-13.)

- The Foremen should, on a random basis, check the job sites to ensure the craftspersons are in fact working.

(3) A reduction in time to 10 minutes per day (2.0%) is an obtainable goal for Baumholder.

D. 340 Idle (Not Controlled by DEH) - 0.6%

(1) This category reflects the idle time spent by the craftspersons that is caused by factors outside the control of the Directorate of Engineering and Housing.

(2) The time of 3 minutes is acceptable.

II.A.4 Analysis of First and Last Productive Effort

This data is based on actual observations during the work sampling process illustrated in the following table:

TABLE II-A-4

BAUMHOLDER MILITARY COMMUNITY AND FORT SILL  
AVERAGE START/STOP TIMES  
(FIRST AND LAST CODE 100 PRODUCTIVE WORK)

MORNING START	TIME LOST	MORNING STOP	TIME LOST	AFTERNOON START	TIME LOST	AFTERNOON FINISH	TIME LOST	TOTAL AVG. PRODUCTIVE TIME LOST PER PERSON PER DAY
* * * BAUMHOLDER MILITARY COMMUNITY * * *								
0804	34	1145	15	1242	12	1525	35	96
* * * FORT SILL * * *								
0751	21	1117	13	1205	5	1538	22	61

This table brings attention to how soon the average first productive effort takes place in the morning, how early it stops before and starts

after lunch, and how early it ends before quitting time. The type of items that influence these start and stop times are:

- Job preparation prior to starting work in the morning
- Returning to shops for lunch and returning go the same vicinity or job after lunch
- Lack of truck stock
- Returning to the shops to receive new work assignments
- Inadequate transportation
- Being at the shops 35 minutes before quitting time
- Lack of supervision beyond the shop (i.e., in the field)

(1) As shown in Table II-A-4 the total lost productive time averages 96 minutes or one hour and thirty-six minutes per day. Approximately 72% of the total time lost was before the first productive effort in the morning (34 minutes) and the last productive effort just before quitting time (35 minutes).

(2) As indicated in Exhibit II-5, page II-32, approximately 19.3% of the workers were observed beginning their first productive effort 16 to 20 minutes after 7:30 a.m., another 11.4% began work 21 to 25 minutes later; with 12.5% beginning as late as 36 to 40 minutes and 12.5% starting as late as one hour in the mornings. Also observed, as indicated in Exhibit II-6, page II-32, productive work stopped around 16 to 20 minutes (10.2%) before lunch with 9.1% stopping between 26 and 30 minutes before lunch. Some workers (4.5%) were observed being nonproductive 40 minutes before breaking for lunch. As shown on Exhibit II-7, page II-33, 15.5% of the workers work sampled did not begin a productive effort until 11 to 15 minutes after finishing their lunch break; 19% did not begin any effort until 16 to 20 minutes after lunch

and another 7% until 25 minutes after lunch time. During the last productive effort in the afternoon (Exhibit II-8, page II-33) 7.2% were observed quitting 31 to 35 minutes before the end of the day and another 8.4% 36 to 40 minutes before the end of the work day. But, most important of all, 14.5% of the workers sampled stopped working over an hour before quitting time.

(3) By returning to the shop, a total of 27 minutes per day (5.6%) is expended before and after lunch by craftspersons. There is also a total of 69 minutes (14.4%) expended before productive work starts in the morning and after productive work ends in the evening. This is a significant amount of craft time that is not being utilized. It is recognized that this 96 minutes cannot be converted entirely to productive time, but with the implementation of the recommendations presented previously in the various categories and in the balance of the study, it is considered that the following goals are obtainable:

	<u>WORK HOURS</u>	<u>FIRST/LAST PROD. WORK</u>	<u>TIME LOST</u>
Morning Start	0730	0755	25
Break for Lunch	1200	1150	10
Afternoon Start	1230	1235	5
Afternoon Stop	1600	1530	30
			70

This is 12 minutes (2.5%) per day gained through better stop/start at lunch and 14 minutes (2.9%) per day gained at morning start and evening stop.

The 70 minutes per day (14.6%) goal will enable Baumholder craftspersons to have an additional 26 minutes (5.4%) per day available for productive work. The recommended morning start and evening stop time for productive work includes time consideration for travel outside of the cantonment area to areas within 10 miles.

(4) The increased productive time identified here is basically a portion of the productive time identified throughout this Appendix in the various categories (i.e. 213, 214, 230 and 330). The purpose of this information is to provide management with framework for increasing productivity.

#### II.A.5 Summary and Recommended Objective

Based on the results of this work sampling study and analysis of various other Army maintenance activities, the following goals are recommended.

	<u>Percent</u>	<u>Time</u>
Productive	62.6	5h 0m
Indirect Productive	26.2	2h 6m
Nonproductive	<u>11.2</u>	<u>0h 54m</u>
	100.0%	8 hours

The 62.6% projected goal for Baumholder is based partially on the premise that craftspersons will eat on the job site. An increase of 2.5% is projected in productive work if this policy is adopted. If craftspersons are allowed to continue the practice of returning to shops or subshops for lunch, the projected figure would be as shown below:

	<u>Percent</u>	<u>Time</u>
Productive	60.1	4h 48m
Indirect Productive	28.7	2h 18m
Nonproductive	<u>11.2</u>	<u>0h 54m</u>
	100.0%	8 hours

The total recommended adjustments are presented in Table II-A-5.

TABLE II-A-5  
TIME PERCENTAGE ADJUSTMENTS

CATEGORY	CURRENT %	CURRENT TIME	PROPOSED %	PROPOSED TIME	DELTA %	DELTA TIME
100 Prod	55.0	4h 24m	62.6	5h 0m	+7.6	+37m
213 Layout Tools, Equip.	5.5	0h 27m	3.1	0h 15m	-2.4	-12m
214 Clean up Job Site	2.3	0h 11m	1.4	0h 7m	-0.9	-4m
230 Travel	12.5	1h 0m	10.0	0h 48m	-2.5	-12m
330 Idle	3.8	0h 18m	2.0	0h 10m	-1.8	-8m

The target of 62.6% direct productive time is an attainable goal if the DEH management institutes the procedural changes suggested in this and subsequent sections of this report. Mere familiarization with the problems and suggested solutions will not implement the changes. The blue-collar workforce must be informed of the problem areas, the goals set, and the influences or changes they can implement to attain these goals.

The most significant improvement in productivity will result from reduced travel time (230) attributed to craftspersons eating on the job site, craftspersons being given a full day's workload when they leave the shop in the morning, and additional trucks being made available. These procedural changes will save 2.5% or 12 minutes of craft time per person per day for a total annual cost avoidance of \$51,932, computed as follows:  $2.5 \times \$20,773$  (1% of available labor) = \$51,932. See Exhibit II-4, page II-28, for computation of average wage and cost of available labor.

While this is not a common practice at all other activities, Forts Sill and Hood and 13 of 14 private commercial activities in the Tidewater, Virginia area have their work forces eat on the job site. The

commercial firms included air conditioning/heating shops, carpentry, electrical, plumbing, painting and general contractors.

Figure II-1, page II-25, illustrates graphically what the anticipated savings would be if the 62.6% goal is obtained and is based on the calculations contained in Exhibit II-4, page II-28. The actual annual savings in Figure II-1 is \$157,874 and was realized from four categories shown below in Table II-A-6.

TABLE II-A-6  
DISTRIBUTION OF SAVINGS BY CATEGORY

<u>CATEGORY</u>	<u>PERCENT CHANGE</u>	<u>DOLLAR SAVINGS</u>
213 Layout Tools, Equip.	-2.4	\$ 49,855
214 Clean up Job Site	-0.9	18,696
230 Travel	-2.5	51,932
330 Idle	-1.8	37,391
		<u>\$157,874</u>

Table II-A-7, beginning on page II-26, contains the percentage and time distribution based on the 20,435 observations made during the initial on-site phase of this study.

Exhibit II-9, beginning on page II-34, contains Examples A through L that present daily recounts of observations made during the course of this study, with conclusions and recommendations that will assist in improving Baumholder's productive time to 62.6%. No attempt is made to place any individual on report or any particular shop under scrutiny. These examples are findings of fact and are used solely as factual support for conclusions drawn and recommendations made by HAMM ASSOCIATES.

FIGURE II-1

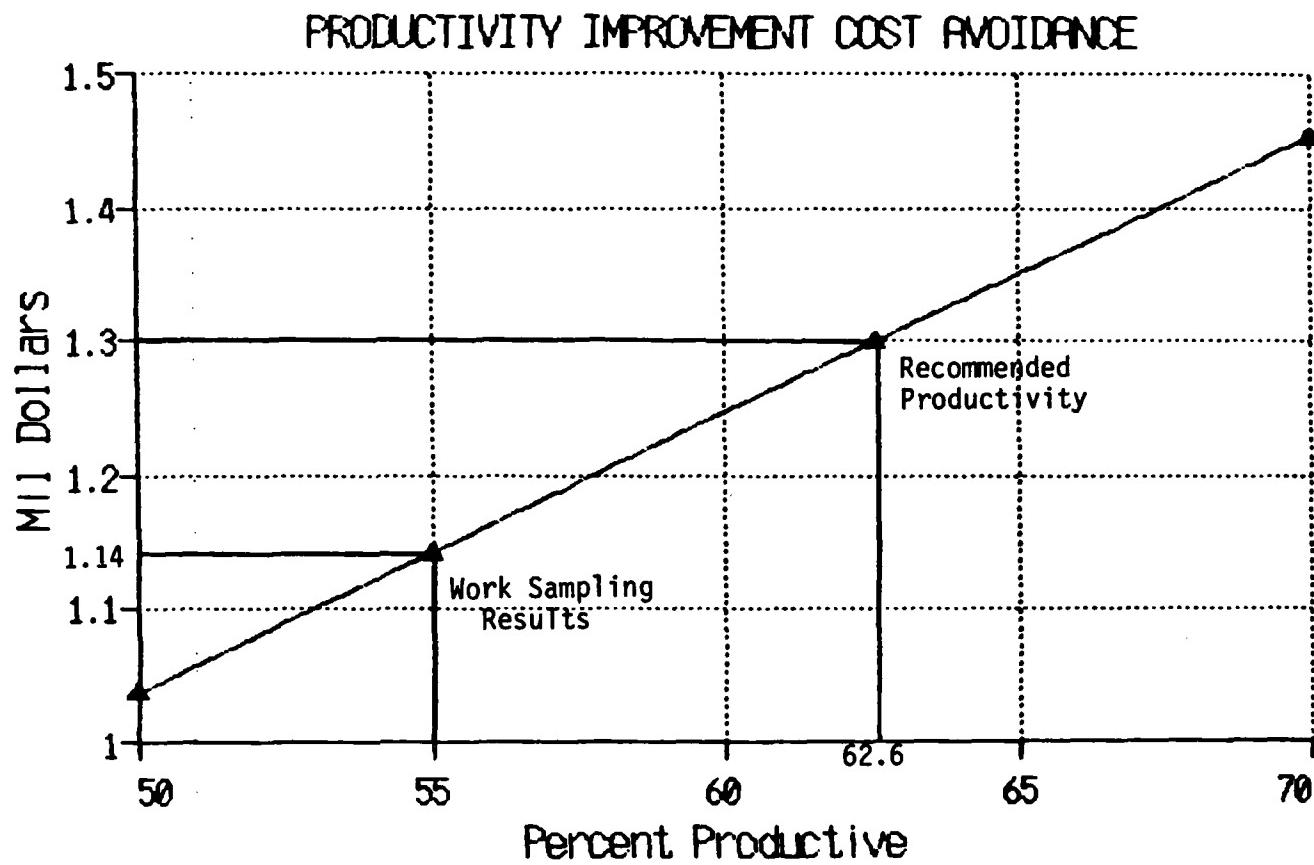


TABLE II-A-7  
PERCENTAGE DISTRIBUTION

<u>CODE</u>	<u>CATEGORIES</u>	<u>PERCENT</u>	<u>TOTAL OBSERVATION</u>	<u>TIME</u>
100	Productive	55.0	10,935	4h 24m
200	Indirect Productive	32.0	6,988	2h 34m
210	Job Preparation	11.1	2,484	53m
211	Receiving instructions from Supervisor	1.4	277	7m
212	Get and Put Away Tools and Equipment	1.3	345	6m
213	Lay Out and Put Away Tools, Equip., and Material at Job Site	5.5	1,176	26m
214	Clean up Job Site	2.3	571	11m
215	Personal Clean up at Job Site	.4	73	2m
216	Safety Precautions	.2	42	1m
220	Material Handling	1.5	352	7m
230	Travel	12.5	2,782	1h 0m
240	Planning on the Job Site	2.4	555	12m
250	Balancing Delay	2.2	446	11m
260	Maint. of shop tools and equip.	1.5	187	7m
270	Housekeeping	.1	22	1m
290	Paperwork	.7	164	3m
300	Non-Productive	13.0	2,512	1h 2m
310	Personal	8.6	1,538	41m
311	Head	.3	55	1m
312	Idle	4.2	620	20m
313	Cleanup and Dressing	.4	84	2m
314	Coffee Breaks and Rest Periods	3.7	779	18m
320	Official	0	0	0m
330	Idle - Not controlled by craftsman	3.8	826	18m
331	Await Transportation	.6	132	3m
332	Await Assignment	1.0	182	5m
333	Await Tools, Materials and Equip.	.7	157	3m
334	Two persons on a one person job/poor scheduling	1.5	355	7m
340	Idle - Not Controlled by DEH	.6	148	3m
341	Await Other Departments of Divisions	.6	148	3m
342	Power Failure	0	0	0m
343	Inclement Weather	0	0	0m
		100.0%	20,435	8h 0m

### PRODUCTIVE by SHOP

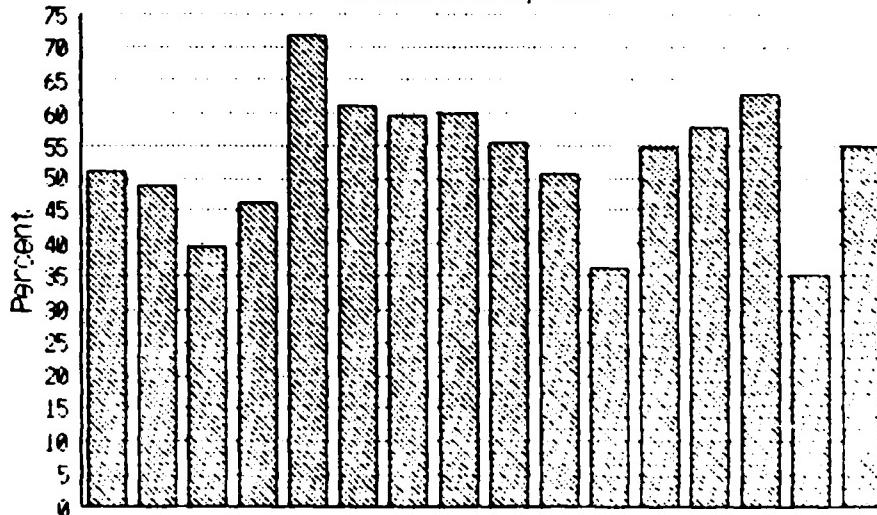


EXHIBIT II-1

### INDIRECT PRODUCTIVE by SHOP

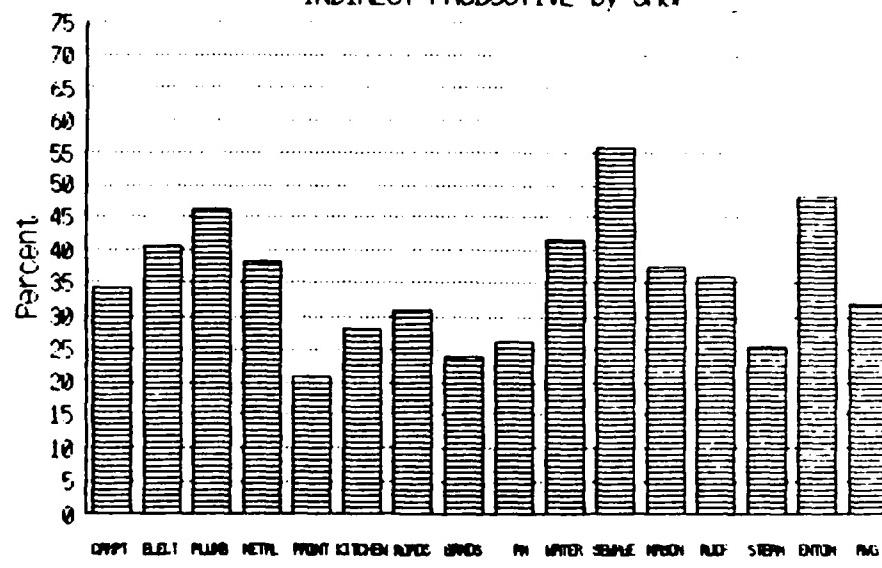


EXHIBIT II-2

### NONPRODUCTIVE by SHOP

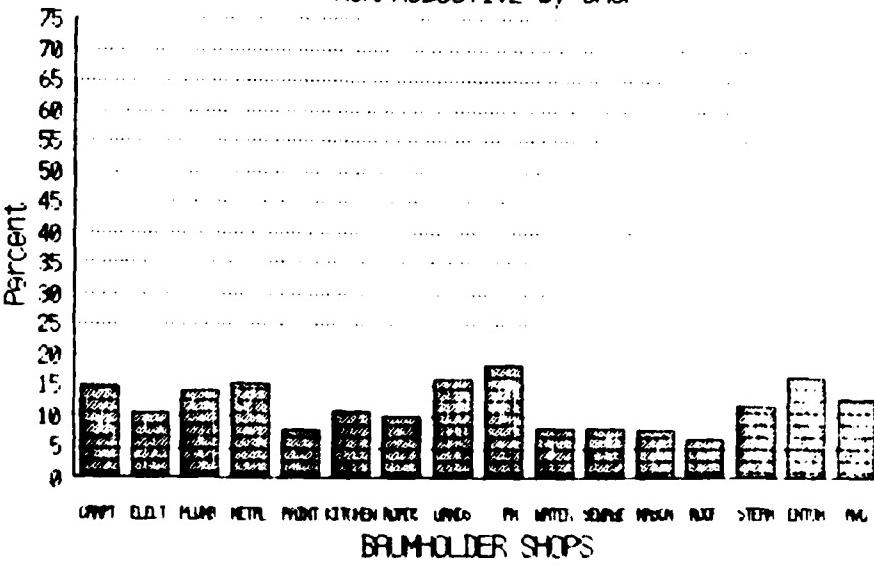


EXHIBIT II-3

BAUMHOLDER SHOPS

## EXHIBIT II-4

COMPUTATION OF AVERAGE WORKER WAGE

<u>SECTION</u>	<u>GRADE</u>	<u>NO.<sup>1</sup></u>	<u>(DM) COST<sup>2</sup></u>
<u>Carpentry</u>			
Carpenter	A-4/6	15 <u>15</u>	446,160 <u>446,160</u>
<u>Metal Work</u>			
Sheet Metal Mechanic	A-4/6	3	89,232
Sheet Metal Mechanic	A-4/5	1	27,310
Lathe Operator	A-4/7	1	31,304
Locksmith	A-4/6	3	89,232
Metal Worker	A-4/6	7	208,208
Sheet Metal Mechanic	A-4/5	1 <u>16</u>	27,310 <u>472,596</u>
<u>Roofers</u>			
Roofers	A-4/6	5 <u>5</u>	148,720 <u>148,720</u>
<u>Mason</u>			
Mason	A-4/6	16	475,904
Tile Layer	A-4/6	1 <u>17</u>	29,744 <u>505,648</u>
<u>Painter</u>			
Sign Painter	A-4/6	1	29,744
Painter	A-4/6	9	267,696
Painter (Temp.)	A-4/6	1	29,744
Painter	A-4/4	1 <u>12</u>	26,582 <u>353,766</u>
<u>Preventive Maintenance</u>			
PM Mechanic	A-4/6	4	118,976
PM Mechanic	A-4/5	18	491,580
PM Mechanic (Spec Tam)	A-4/6	4	118,976
PM Mechanic (Spec Tam)	A-4/5	5 <u>31</u>	136,550 <u>866,082</u>

## EXHIBIT II-4 (continued)

<u>SECTION</u>	<u>GRADE</u>	<u>NO.<sup>1</sup></u>	<u>(DM) COST<sup>2</sup></u>
<u>Roads</u>			
Paver	A-4/6	3	89,232
Roads Worker	A-4/3	10	243,984
Roads Worker (Temp.)	A-4/3	2	48,797
		<u>75</u>	<u>382,013</u>
<u>Grounds</u>			
Gardener	A-2/6	2	53,706
Gardener	A-2/5	1	25,147
Grounds Maint. Leader	A-2/3	6	139,152
Grounds Maint. Leader	A-2/2	2	41,891
Grounds Maint. Wkr. Temp.	A-4/3	1	24,398
Grounds Maint. Wkr.	A-2/3	5	115,960
Grounds Maint. Wkr.	A-1/2	20	398,528
Grounds Maint. Wkr. Temp.	A-1/2	4	79,766
		<u>41</u>	<u>878,480</u>
<u>Entomology</u>			
Pest Controller Leader	A-2/6	1	26,853
Senior Pest Controller	A-2/6	1	26,853
Pest Controller	A-2/5	1	25,147
Pest Controller	A-2/3	<u>3</u>	<u>69,576</u>
		<u>6</u>	<u>148,429</u>
<u>Plumbing</u>			
Plumber	A-4/6	<u>8</u>	<u>237,952</u>
		<u>8</u>	<u>237,952</u>
<u>Steamfitting</u>			
Pipefitter	A-4/6	22	654,368
Pipefitter (overhires)	A-4/6	1	29,744
Pipefitter (overhires)	A-4/5	1	27,310
Oilburner Mechanic	A-4/6	3	89,232
		<u>26</u>	<u>800,654</u>
<u>Refr &amp; A/C</u>			
Refrig A/C Mechanic	A-4/6	7	208,208
Refrig A/C Mech (overhire)	A-4/6	<u>1</u>	<u>29,744</u>
		<u>8</u>	<u>237,952</u>

## EXHIBIT II-4 (continued)

<u>SECTION</u>	<u>GRADE</u>	<u>NO.<sup>1</sup></u>	<u>(DM) COST<sup>2</sup></u>
<u>Kitchen Equipment</u>			
Kitchen Equip. Mech.	A-4/6	3	89,232
Kitchen Equip. Mech.(Temp)	A-4/6	1	29,744
		<u>4</u>	<u>118,976</u>
<u>Electrical</u>			
Generator Mechanic	A-4/6	2	59,488
Electrician	A-4/6	15	446,160
Electrician (overhires)	A-4/6	4	118,976
Electrician (Temp)	A-4/5	1	27,310
		<u>22</u>	<u>651,934</u>
<u>Water Service</u>			
Plumber/Water System Maintenance	A-4/6	<u>7</u>	<u>208,208</u>
			<u>208,208</u>
<u>Sewage Maintenance</u>			
Sewage Worker	A-1/2	3	59,779
Sewage Truck Driver	A-5/6	4	107,411
Sewage Mason & Repairs	A-4/6	1	29,744
		<u>8</u>	<u>196,934</u>
<u>Refuse Collection</u>			
Heavy Equip. Operator Refuse Collection	A-5/6	5	134,264
	A-5/6	6	161,117
		<u>11</u>	<u>295,381</u>
GRAND TOTAL		252	DM 6,949,885
TOTAL U.S. DOLLARS <sup>3</sup>			\$2,564,533

<sup>1</sup> Reflects number of craftsmen included in the work sampling study.

<sup>2</sup> Cost is unburdened and in Deutsch Marks (DM).

<sup>3</sup> To convert DM to U.S. dollars, a conversion rate of \$1.00 = DM2.71 was used.

EXHIBIT II-4 (continued)

Average Wage = Total Unburdened Cost/No. Spaces/Annual Hours

Average Wage = \$2,564,533/252/2080 = \$4.89

% Labor Available = 1686/2080 x 100 = 81.1% or 81%

Cost of Available Labor = 81% x 2,564,533 = \$2,077,272

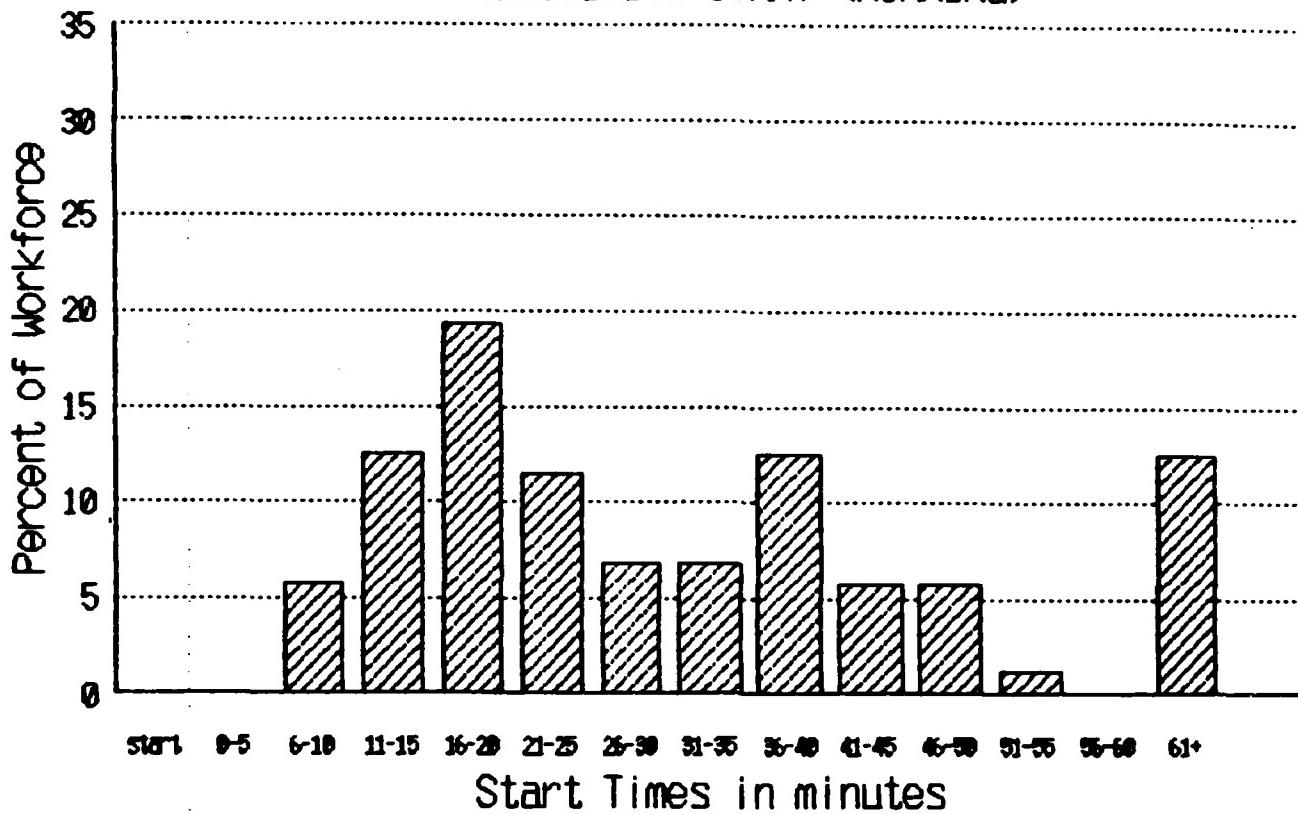
1% of Available Labor = \$20,773

Work Sampling Productive Cost of Available Labor - 55.0% x \$2,077,272 =  
\$1,142,500

Recommended Direct Productive Cost of Available Labor - 62.6% x  
\$2,077,272 = \$1,300,372

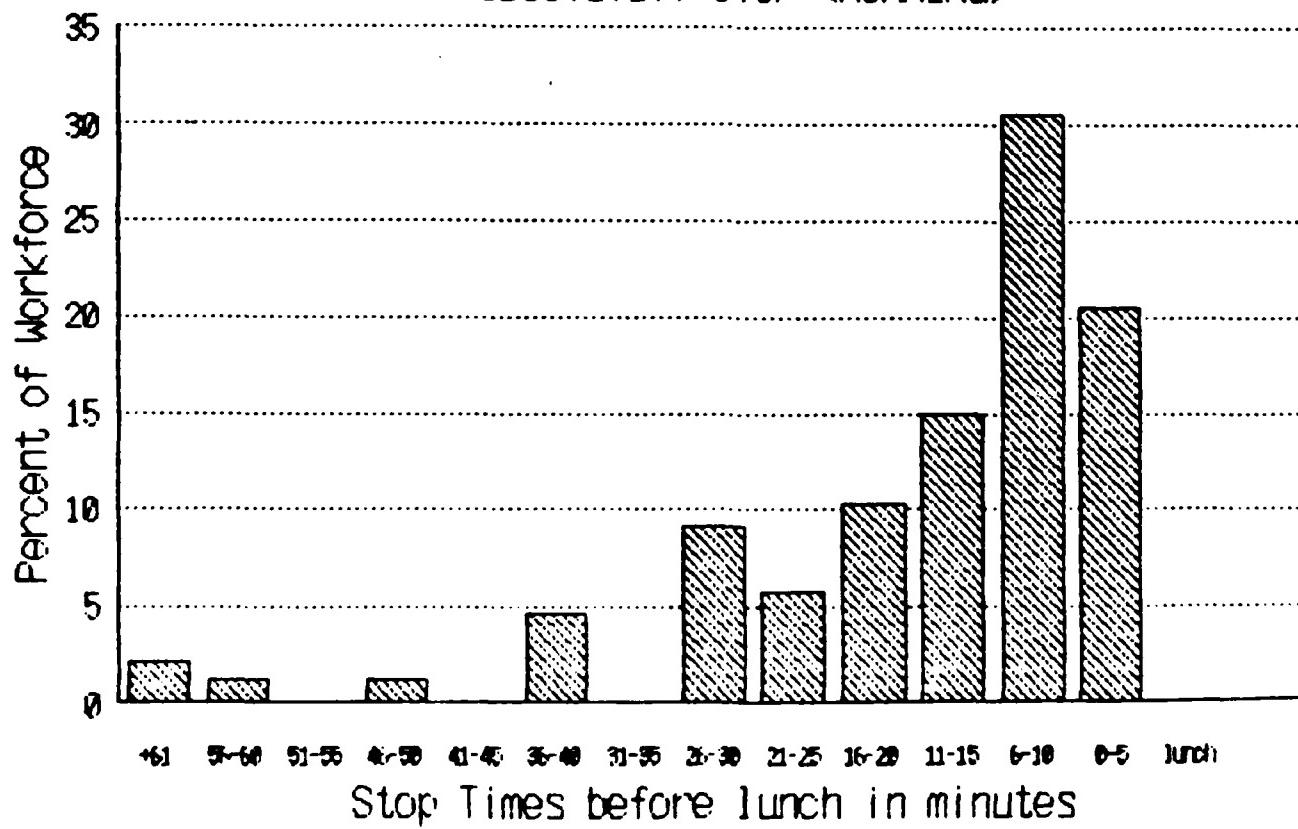
## EXHIBIT II-5

## PRODUCTIVITY START (MORNING)

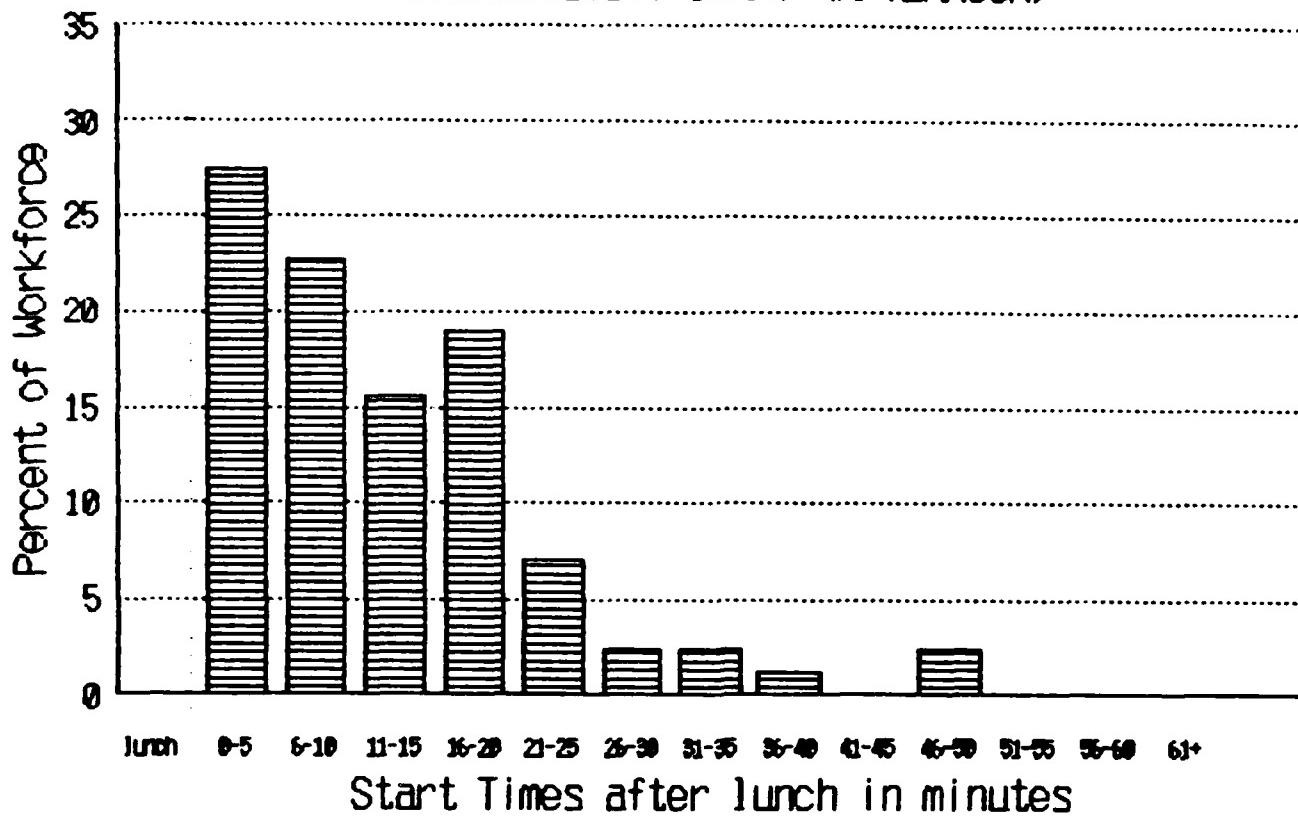


## EXHIBIT II-6

## PRODUCTIVITY STOP (MORNING)



## PRODUCTIVITY START (AFTERNOON) EXHIBIT II-7



## PRODUCTIVITY STOP (AFTERNOON) EXHIBIT II-8

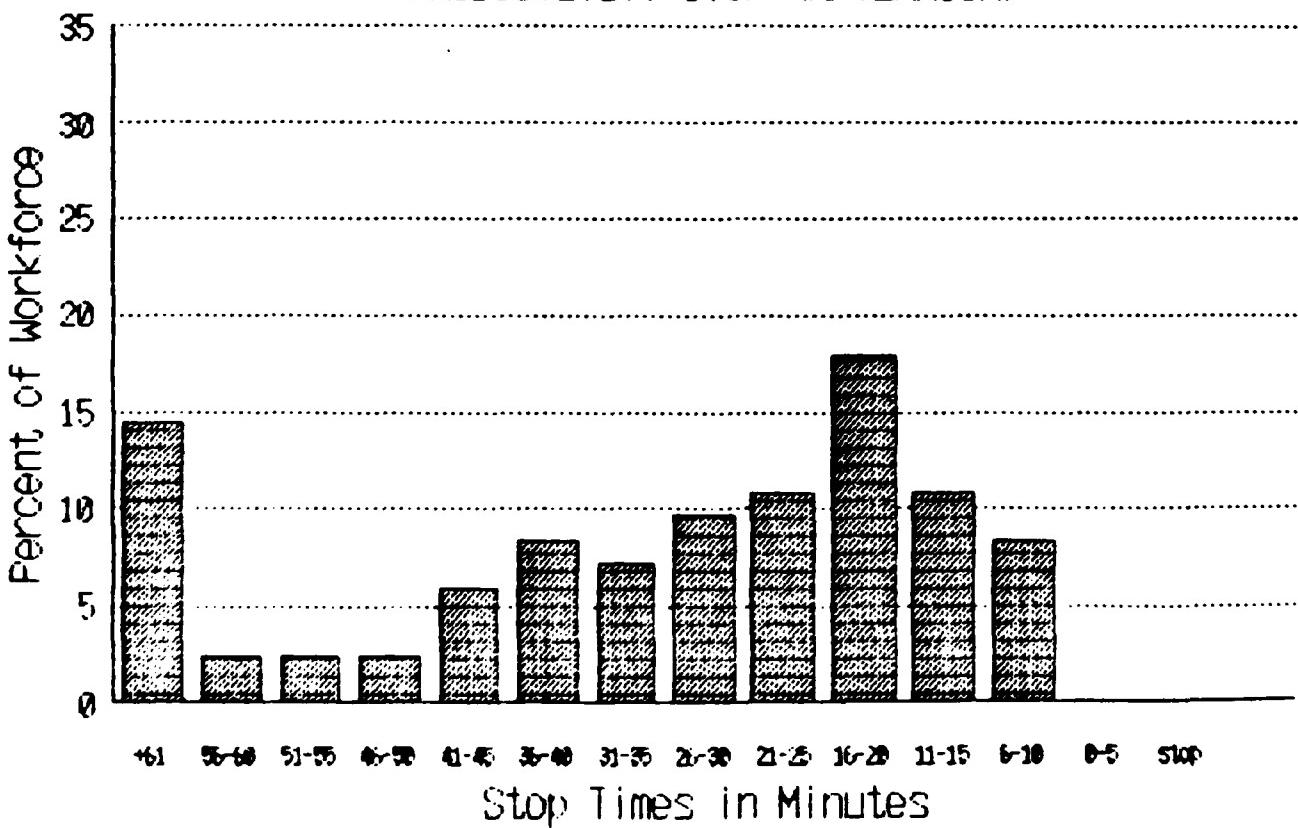


EXHIBIT II-9

WORK SAMPLING EXAMPLES

EXAMPLE A

SHOP: Plumbing, A-4

Finding of Fact

- 0730 Receiving instructions from supervisor  
0732 - 0736 Idle as result of waiting for a truck for transportation to job site  
0738 - 0742 Travel to job site; Bldg. 8016 Lime Street  
0744 Planning course of action to be followed to repair leaking pipes for SO #195874, 7/30/84  
0746 - 0802 Idle - NOTE: Two persons on a one person job  
0804 Planning on job site  
0806 - 0808 Obtaining tools from truck  
0810 - 0812 Travel back to shop for more materials (1)  
0814 - 0816 Obtaining materials from shop stock  
0818 Travel to warehouse for parts  
0820 - 0822 Craftsman is delayed by waiting for someone to assist him at warehouse  
0824 Craftsman obtains materials  
0826 - 0832 Travel back to shop and then back to job site  
0834 - 0836 Obtaining materials and tools  
0838 Idle  
0840 - 0844 Travel back to shop (2)  
0846 Obtaining parts and tools from shop  
0848 Craftsman washing his hands  
0850 - 0854 Travel to Bldg. 8328  
0856 - 0900 Planning at job site with customer

EXHIBIT II-9

0902           Obtaining tools from truck  
0904 - 0910    A-4 repairing leaking pipe for SO #198104, 8/1/84  
                (NOTE: Date of SO; work order was prepared the same day  
                it was issued to the shop.)  
0912           Putting away tools and ladder  
0914 - 0918    Travel back to shop for next assignment (3)  
0920           Idle awaiting next assignment  
0922           Unloading ladder off truck  
0924           Receiving instructions for next assignment  
0926           Craftsman washing his hands  
0928 - 0936    Break  
0938           Travel to work reception office  
0940           Picked up service order for shop  
0942 - 0946    Travel to next job site; Bldg. 8501  
0948 - 1024    A-4 repairing leak in boiler room for SO #187404; 7/16/84  
1026 - 1028    Finished replacing leaking pipes and making inspections of  
                hot water in bathrooms on 2nd and 3rd floors  
1030 - 1032    Putting away tools and materials  
1034 - 1038    Travel back to Bldg. 8016 Lime Street  
1040 - 1046    Idle because of the lack of an assignment  
1048           Assisting other worker in loading tools and materials onto  
                truck  
1050           Idle  
1052           Putting away more tools and materials  
1054 - 1058    Travel back to the shop for an assignment (4)  
1100           Receiving instructions from supervisor  
1102 - 1106    Travel to next job site; Bldg. 8110  
1108           Discussing job with customer

EXHIBIT II-9

1110      Began SO #197814; 8/1/84 to install new thermostat valve system for hot water boiler system

1112      Idle

1114      Cleaning up job site

1116 - 1118      Idle

1120 - 1132      Replacing old valves and pipes

1134      Obtaining more equipment

1136 - 1144      Began installing new thermostat valves and new pipes

1146 - 1148      Idle. NOTE: Two persons on a one person job

1150      Putting away tools and materials on truck

1152      Idle

1154 - 1156      Travel back to shop for lunch (5)

1158      Craftsman washing his hands

1200      Lunch

1230 - 1234      A-4 cutting pipes for later use at job site

1236 - 1240      Obtaining materials and parts from shop stock storage room

1242      Cutting more pipe

1244      Obtaining more materials

1246 - 1250      Cutting more pipe

1252      Loading cut pipes, tools, equipment and materials onto truck

1254      Worker using restroom

1256 - 1258      Travel back to job site, Bldg. 8110

1300 - 1308      A-4 bleeding hot water out of pipe lines

1310      Waiting for other craftsman to heat pipes with gas burner

1312 - 1316      Removing old pipe joints after heating

EXHIBIT II-9

1318           Idle  
1320           Installing new pipes  
1322           Idle  
1324 - 1330    Installing more new pipes  
1332           Idle  
1334           Assisting other craftsman install new thermostat unit  
                to pipe connections  
1336 - 1344    Idle  
1346 - 1348    Connecting thermostat valves unit to new pipes  
1350 - 1356    Idle  
1358 - 1400    Travel back to shop (6)  
1402 - 1408    Cutting more pipes for later use at job site  
1410 - 1412    Travel back to job site; Bldg. 8110  
1414 - 1418    Installing more pipes to thermo unit  
1420 - 1422    Reading manual instructions for installing thermo unit  
1424           Waiting until other craftsman turns water back on  
1426 - 1428    Inspecting hot water system; checking all valves and  
                gauges to finish work order assignment  
1430           Reading manual again  
1432           Idle  
1434 - 1442    Break  
1444 - 1446    Putting away tools, equipment and materials  
1448           Travel to next job site; Bldg. 8112  
1450 - 1458    Began SO #198434, 8/1/84 by removing insulation wrapped  
                around the pipes to be repaired  
1500           Idle

EXHIBIT II-9

1502            Cleaning up wrappings from pipe installation  
1504            Idle  
1506 - 1510    Travel back to shop for more pipe (7)  
1512            Unloading tools from truck  
1514            Travel to supply shop  
1516            Idle - waiting to gain access into warehouse  
1518 - 1524    Obtaining new pipe for use at job site  
1526 - 1530    Craftsperson doing paperwork  
1532 - 1536    Obtaining more parts from shop stock storage room  
1538 - 1552    Cutting pipe and putting joints on end of cut pipes  
1554            Craftsperson washing his hands  
1556 - 1558    Worker doing paperwork  
1600            End of day

Work Distribution

Direct Productive	34.2%
Indirect Productive	41.6%
Non-Productive	24.2%
	100.0%

Major Problem Areas:

- 10% of the craftsperson's time was spent in job preparation. An average time of 48 minutes for job preparation is slightly high.
- 18% of craftsperson's time was wasted due to lack of assignments and waiting for proper equipment.
- 19% of craftsperson's time was spent traveling. Excessive travel reduces productivity.

This example shows how productive time is lost because the craftspersons are making too many trips back and forth obtaining tools and materials from the truck and/or tool box. Insufficient work backlog contributed to both excessive travel and two workers performing tasks requiring only one craftsperson (lack of assignments). Craftsperson was observed returning to the shop for supplies and new assignments seven times. Minimal truck stock and lack of assignments contributed to

EXHIBIT II-9

unnecessary repetitive shop trips. A shortage of vehicles, a lack of truck stock, and a lack of work backlog in the shop contributes to the above low productivity.

Recommendations

Several recommendations can be made as a result of this example:

- The creation of a policy requiring the workers to eat lunch at the job site combined with allowing a variable lunch hour could contribute to increasing productive time.
- It is recommended that a thorough screening of S0s, IJ0s, etc. be accomplished by the shop foreman; ensuring the completeness of the description of the work to be done, and that the P&E function is correct (within experienced reasoning).
- Full days work: It is very important that the workers be fully occupied. ERMD must be fully aware of each shop's capabilities and requirements. Workers have an obligation to keep their supervisors informed if they are not fully occupied.
- Build up a work backlog to ensure that a sufficient workload is available for assigning tasks and scheduling work to the workers.
- Increase the number of trucks available for craftsmen and shops use. A shortage of trucks contributes to truck stocks being minimal. Better truck stock would have precluded repetitive shop trips.

All of the above recommendations, along with other improvements in scheduling, planning and most important field supervision, should reduce craftsman travel time securing special tools, materials, etc. and reduce the time spent planning at the job site.

## EXAMPLE B

SHOP: Roofing, A-4/6

Findings of Fact

- 0730 Receiving instructions from supervisor  
0732 - 0734 Loading truck  
0736 - 0740 Travel to Bldg. 8056  
0742 - 0744 Unloading tools and bringing shingles onto roof  
0746 - 0840 Replacing shingles on roof  
0842 Getting new shingles from attic  
0844 Throwing old shingles to ground  
0846 - 0850 Replacing shingles on roof  
0852 Moving shingles to other side of roof  
0854 - 0924 Replacing shingles on roof  
0926 - 0934 Break  
0936 - 0938 Idle  
0940 - 0950 Replacing shingles on roof  
0952 Throwing old shingles to ground  
0954 - 1036 Replacing shingles on roof  
1038 Idle  
1040 - 1144 Replacing shingles on roof  
1146 - 1148 Throwing old shingles to ground  
1152 - 1154 Travel  
1156 - 1158 Clean up and prepare for lunch

EXHIBIT II-9

Work Distribution - morning

Direct Productive	80.0%
Indirect Productive	12.6%
Non-Productive	7.4%
	<u>100.0%</u>

Findings of Fact

- 1230 Idle
- 1232 Loading shingles on truck
- 1234 - 1236 Travel back to job site
- 1238 - 1240 Bringing singles up to roof
- 1242 Laying out tools
- 1244 - 1336 Replacing shingles on roof
- 1338 Throwing old shingles to ground
- 1340 - 1346 Replacing shingles on roof
- 1348 Discussing job with foreman
- 1350 - 1354 Replacing shingles on roof
- 1356 Idle
- 1358 Throwing old shingles to ground
- 1400 - 1412 Replacing shingles on roof
- 1414 - 1418 Bringing tools back to truck
- 1420 - 1422 Bringing unused shingles down
- 1424 - 1514 Picking up discarded shingles from around building and placing on truck
- 1516 - 1522 Driving to dump
- 1524 - 1528 Unloading discarded shingles at dump
- 1530 - 1534 Travel back to job site
- 1536 - 1540 Picking up tools at job site

EXHIBIT II-9

1542 - 1544      Travel  
1546 - 1548      Unloading tools at shop  
1550 - 1554      Stacking new shingles  
1556 - 1558      Idle

Work Distribution - afternoon

Productive	39.1%
Indirect Productive	57.1%
Non-Productive	3.8%
	100.0%

Major Problem:

Cleanup            28.6%

Workers quit roofing at 1412 in order to begin cleanup, causing their afternoon productivity to drop to 39.1% from 80.0% in the morning.

Recommendation

Rather than 3 craftspersons spending an hour each cleaning up, a crew of helpers should be established to clean up all job sites and bring debris to dump.

## EXAMPLE C

SHOP: Masonry, 2 A-4

Finding of Fact

- 0730 - 0732 Both craftspersons engaged in a discussion with supervisor.
- 0734 - 0744 Securing tools and materials from storage area
- 0746 - 0748 One craftsperson filling out paperwork while the other secures materials from storage area
- 0750 - 0752 Travel to central accounting office
- 0754 Securing key to Bldg. 8661
- 0756 Travel to Bldg. 8661
- 0758 - 0800 Securing tools and materials from vehicle
- 0802 - 0850 One craftsperson spackeling cement in and around door facing (exterior "walk-in" freezer door), while the other prepares wooden frame for concrete foundation.
- 0852 Securing equipment from vehicle
- 0854 - 0856 Planning at the job site
- 0858 Filling out paperwork
- 0900 - 0902 Travel to shop
- 0904 Loading two 10 gallon containers on vehicle
- 0906 - 0908 Filling two 10 gallon containers with water
- 0910 - 0916 Loading sand and gravel on vehicle
- 0918 - 0922 Travel to Bldg. 8661
- 0924 - 0932 Unloading sand and water containers from vehicle
- 0934 - 0944 Break
- 0946 - 0948 Travel to sand dump behind maintenance shop
- 0950 - 0958 Loading sand and gravel on vehicle
- 1000 Travel to shop building

EXHIBIT II-9

1002 - 1006 Loading concrete mix on vehicle  
1014 - 1016 Positioning concrete mixer  
1018 - 1020 Unloading vehicle  
1022 - 1034 One craftsman applying sticking solution to existing concrete while the other spackles door facing  
1036 - 1052 One craftsman mixing concrete while the other dumps sand in foundation  
1054 - 1136 One craftsman mixing and pouring concrete into foundation while the other smooths out the cement  
1138 - 1142 Securing tools and equipment in storage area  
1144 Planning at the job site  
1146 - 1152 Cleaning up job site  
1154 - 1158 Travel to shop  
1200 Lunch  
1230 - 1238 Securing sand and other materials for later use at the job site  
1240 - 1244 Head  
1246 Securing equipment in shop for use at the job site  
1248 - 1252 Travel to Bldg. 8661  
1254 Unloading tools and materials from vehicle  
1256 - 1318 One craftsman mixing and placing concrete in foundation while the other finishes the concrete  
1320 - 1328 Cleaning up the job site  
1330 - 1338 One craftsman mixing and placing concrete into foundation while the other finishes the concrete.  
1340 - 1352 One craftsman finishing concrete in foundation while the other applies cement spackle to door facing  
1354 - 1358 Securing tools and equipment in storage area  
1400 - 1404 Time spent by the craftsman finishing concrete

EXHIBIT II-9

1406	Securing equipment in storage
1408 - 1428	Cleaning up the job site
1430	Finishing concrete
1432 - 1440	Break
1442 - 1444	Loading trash on vehicle
1446 - 1454	Travel to trash dump
1456 - 1504	Removing trash from vehicle
1506 - 1514	Travel to Bldg. 8661
1516 - 1528	Both craftsmen doing touch-up type work on concrete foundation
1530 - 1534	Securing tools and equipment on vehicle
1536 - 1542	Cleaning concrete mixer
1544	Travel to central accounting building to return key
1546 - 1552	Planning
1554 - 1558	Travel to shop
1600	End of work day

Conclusion

The two craftspersons observed performed masonry type work, which included constructing a 3'x6'x1' concrete platform and spackeling cement around an exterior door to smooth out the door facing. The quality of work performed was good; but the time to complete this task appeared to be excessive. The craftspersons spent from 7:58 a.m. to 3:52 p.m. to complete this task. The craftspersons failed to plan for materials required to effect this task; and as a result, two trips to the shop for materials were made. Also, both craftspersons traveled to the shop when one could have sufficed. The trip from the trash dump to the job site to pick up tools and materials could have been avoided by placing tools and materials on the vehicle ahead of the trash. It soon became obvious that the work by the craftspersons was being stretched out in order to fill out the day.

Consultation with other HAMM ASSOCIATES personnel revealed that there is little service order backlog in this shop, and a sufficient backlog in IJO work.

EXHIBIT II-9

Recommendation

It is recommended that the shop foreman plan the proper mix of service order work and individual job order work in a manner that will keep the craftspersons gainfully productive throughout the work day. This will require establishing a service order backlog. Also, the foreman stress to the craftsperson, the need for proper planning of work.

EXHIBIT II-9

EXAMPLE D

SHOP: Electric, 2 ea. A-4

Finding of Fact

- 0730 - 0738 Time spent by the craftspersons securing tools and materials in shop
- 0740 Craftspersons holding discussion with supervisor
- 0742 - 0748 Travel to Bldg. 8748 (remote equipment storage bldg.)
- 0750 Securing supplies on vehicle
- 0752 - 0754 Travel to shop to secure storage building key
- 0756 Securing tools and materials on vehicle
- 0758 - 0834 Travel to remove job site (Tisch Muhl)
- 0836 - 0842 Both craftspersons preparing broken high voltage underground electrical cable for cable splicing
- 0844 - 0846 One craftsperson securing tools and materials from vehicle while the other prepares cable for splicing
- 0848 - 1020 Both craftspersons performing splicing on high voltage underground cable
- 1022 Securing tools and materials on vehicle
- 1024 Cleaning up job site
- 1026 Securing tools on vehicle
- 1028 Planning on the job site
- 1030 Securing tools on vehicle
- 1032 - 1034 Travel to remote sewage pump station
- 1036 - 1042 One craftsperson travel and return with key to pump station while the other waits
- 1044 Securing tools from vehicle
- 1046 - 1058 Both craftspersons inspecting pump

EXHIBIT II-9

1100 - 1128 One craftsman travels to junction box to make connection and returns while the other waits

1130 - 1136 Craftsman repairing pump

1138 Both craftspeople observing that the pump operates properly

1140 Securing tools on vehicle

1142 - 1144 Travel to original job site

1146 - 1158 Filling in hole at the job site

1200 Lunch

1230 - 1242 Filling in hole at the job site

1244 Personal clean up at the job site

1246 - 1250 Both craftspeople idle

1252 - 1332 Travel to shop

1334 Both craftspeople having a discussion with supervisor

1336 - 1338 Securing materials and supplies in shop

1340 Both craftspeople having a discussion with supervisor

1342 - 1348 Travel to Bldg. 8252

1350 - 1352 Securing tools, materials and supplies from vehicle

1354 - 1416 Replacing dryer socket and installing new socket for washer

1418 - 1432 One craftsman installing plastic conduit while the other travels for snacks and return

1434 - 1440 Both craftspeople idle

1442 - 1452 Craftsman installing plastic conduit

1454 - 1502 Both craftspeople on break

1504 - 1528 Installing plastic conduit and pulling electric wires

EXHIBIT II-9

1530 - 1546 One craftsperson connecting electric wires to socket while the other travels to shop for supplies and return  
1548 Testing new a/c socket  
1550 - 1552 Securing tools, supplies and materials on vehicle  
1554 - 1558 Travel to shop  
1600 End of work day

Conclusion

The two craftspersons performed a cable splice on a broken underground high voltage cable. The work performed on the broken cable appeared to be excellent. However, the time spent to effect the repair appeared to be excessive. The craftsperson spent from 8:36 a.m. to 12:50 noon (less 30 minutes for lunch) to complete the above mentioned task; including filling in the hole and checking the operation of a sewage pump.

During the afternoon, the two craftspersons were observed replacing an electrical outlet socket and installing an additional socket approximately 14 feet away from the junction box (with no obstructions). The time expended to effect this task was from 1:50 p.m. to 3:52 p.m. Once again, the work performance of the craftspersons appeared to be excellent, but the time to effect the task appeared to be excessive.

It soon became obvious that the work was being stretched out in order to fill out the day.

After consultation with other HAMM ASSOCIATES personnel, it was learned that this shop has little backlog in service order work and a reasonably sufficient backlog in IJO work; but that the service order work is routinely performed first.

Recommendation

It is recommended that the shop foreman plan the proper mix of service order work and individual job order work in a manner that will keep the craftspersons gainfully productive throughout the work day. This will require establishing a service order backlog. By doing so, more work will be accomplished and travel to shop for more work will be reduced.

EXHIBIT II-9

EXAMPLE E

SHOP: Preventive Maintenance, 2 A-4

Finding of Fact

- 0730 - 0740 Idle as a result of not having proper equipment and truck to take workers to job site
- 0742 - 0750 Travel to job site, Bldg. 8071, Apts. 1, 2, 3, 4
- 0752 - 0754 Discussing plans with occupants
- 0756 - 0758 Travel to next job site; Bldg. 8661 NCO Club
- 0800 Obtaining tools from truck
- 0802 - 0804 Both craftspersons waiting to gain access to building
- 0806 - 0814 One craftsperson repairing wall outlet; other craftsperson idle because of the lack of an assignment
- 0816 Both workers discussing problems with customer
- 0818 - 0820 One worker inspecting and testing electrical wall outlet; other worker obtaining more tools and materials from truck
- 0822 One A-4 changing lite bulb in ceiling; other A-4 waiting for ladder
- 0824 One craftsperson obtaining more tools from truck; other craftsperson idle with no assignment
- 0826 - 0836 One A-4 repaired four (4) electrical wall outlets; other A-4 idle because of the lack of an assignment
- 0838 - 0846 Both craftspersons changing same light bulbs. NOTE: two persons on a one person job
- 0848 - 0852 Both workers receiving instructions from supervisor visiting the job site
- 0854 - 0856 One A-4 drilling holes to nail down carpet; other A-4 testing electrical wall outlets
- 0858 - 0902 One craftsperson obtaining more tools from truck, other craftsperson idle
- 0904 - 0908 Both craftsperson idle

EXHIBIT II-9

0910 One A-4 repairing hinges on door; other A-4 replacing ceiling lamp

0912 - 0924 Both craftspersons replacing ceiling lamps - NOTE: two persons on a one person job

0926 Both workers discussing problems with customer

0928 - 0930 One A-4 repairing electrical cord to toaster and refrigerator; other A-4 was idle

0932 - 0936 One A-4 repairing door knob; other A-4 still repairing electrical cord on refrigerator

0938 - 0946 Break

0948 Both idle

0950 Both discussing job with customer

0952 One craftsperson personal cleanup at job site; other A-4 was idle

0954 - 0958 Both craftspersons repaired one window latch and changed light bulbs - NOTE: two persons on a one person job

1000 - 1002 One A-4 repairing a door knob; other A-4 still changing light bulbs

1004 - 1006 One craftsperson obtaining more materials from truck; other craftsperson idle

1008 One A-4 repairing door on toilet stall; other A-4 obtaining more materials from truck

1010 - 1018 Both craftspersons doing repair jobs in bathroom

1020 A-4 still repairing door on toilet stall; other A-4 obtaining more materials

1022 One craftsperson tightening screws on paper holder; other still obtaining tools and materials from truck

1024 One craftsperson idle because of the lack of an assignment; other craftsperson still obtaining tools and materials from truck

1026 - 1028 One A-4 repairing light unit in walk-in refrigerator at NCO Club kitchen; other A-4 changing light bulbs

EXHIBIT II-9

1030 - 1034 Craftsperson still repairing light fixture in refrigerator; other A-4 idle because of the lack of an assignment

1036 - 1044 Worker finishing repairs on light fixture; other craftsperson changing light bulbs

1046 A-4 putting away unused parts; other worker still changing light bulbs

1048 - 1050 One A-4 changing fluorescent lamps tube in ceiling; other A-4 idle

1052 - 1104 A-4 still changing fluorescent tubes in ceiling lamps; other craftsperson repairing door latch

1106 - 1118 One craftsperson wiping dust off fluorescent lamps in ceiling of kitchen; other craftsperson idle because of the lack of an assignment

1120 - 1124 Worker still wiping off dust from lamps; other A-4 began repairing screen door in kitchen of NCO club

1126 - 1128 One A-4 replacing fluorescent lamp tubes; other A-4 obtaining materials and tools from truck

1130 - 1132 One craftsperson repairing screen on back door; other craftsperson still cleaning and replacing fluorescent lamp and tubes

1134 - 1138 A-4 obtaining more materials from truck to fix screen door; other worker still replacing fluorescent tubes in ceiling lamps

1140 - 1146 Worker still replacing screen on door; other A-4 still replacing fluorescent tubes in ceiling lamps

1148 - 1150 One A-4 continuing to replace fluorescent tubes; other A-4 was idle

1152 Both idle

1154 - 1156 One A-4 cleaning dust off fluorescent lamps; other A-4 idle

1158 Both putting away tools before lunch

1200 Lunch

1230 - 1232 Both idle

EXHIBIT II-9

1234 One craftsperson changing fluorescent tubes; other idle  
1236 One A-4 still changing fluorescent lamp tubes; other A-4 still replacing screen on back kitchen door at NCO club  
1238 - 1248 One craftsperson replacing screen on back door; other A-4 idle because of the lack of an assignment  
1250 One craftsperson obtaining materials from shop; other worker idle  
1252 - 1258 Worker still obtaining materials from shop; other began to remove light bulbs from ceiling of conference room  
1300 - 1318 One A-4 finishing obtaining materials from shop; other A-4 obtaining tools from tool box at job site  
1320 - 1326 One craftsperson repairing leaky faucet; other craftsperson changing light bulbs  
1328 One worker still repairing faucet; other worker idle  
1330 - 1336 Both workers cutting out section of leaking pipe - NOTE: two persons on a one person job  
1338 Both cleaning up job site  
1340 - 1344 One A-4 finishing repairs on faucet; other A-4 idle  
1346 Obtaining more tools from truck  
1348 - 1356 One worker finishing replacing light bulbs; other A-4 idle  
1358 One A-4 putting away tools and materials; other A-4 idle  
1400 Both putting away tools on truck  
1402 One A-4 doing paperwork; other A-4 idle  
1404 Both putting away tools on truck  
1406 - 1408 Travel to next job site; Bldg. 8083 both school and playgrounds  
1410 Both obtaining tools from truck  
1412 - 1422 One A-4 performing P/M on playground (inspecting, lubricating and repairing fences and equipment); other craftsperson idle

EXHIBIT II-9

1424 - 1426 One craftsman obtaining materials from truck; other idle  
1428 - 1430 One craftsman still obtaining materials from truck; other A-4 began repairing swing set  
1432 - 1434 Both craftspeople repairing swing set  
1436 - 1452 One A-4 finishing repairing swing set; other A-4 idle  
1454 One worker putting away tools on truck; other still idle  
1456 - 1458 One craftsman still putting away tools and materials on truck; other craftsman doing paperwork  
1500 One A-4 doing paperwork; other A-4 idle  
1502 Both discussing job with customer  
1504 One worker obtaining tools back from truck after loading; other planning course of action to take  
1506 One craftsman began replacing fluorescent tube in ceiling lamp; other craftsman washing hands  
1508 One A-4 still replacing fluorescent tube; other idle  
1510 Both idle  
1512 - 1534 One craftsman walking around the school not carrying tools, performing PM; other A-4 idle  
1536 - 1540 Both idle  
1542 - 1544 One A-4 performing PM; other idle  
1546 - 1548 One worker using restroom; other idle  
1550 - 1552 One craftsman loading tools back on truck for second time at same job site; other idle  
1554 - 1556 One worker doing paperwork; other idle  
1558 Both travel back to shop  
1600 End of Day

Work Distribution

Direct Productive	41.8%
Indirect Productive	24.0%
Non-Productive	34.2%
	<u>100.0%</u>

## Major Problem Areas:

- 7.1% of craftsperson's time was personal idle time. Time expended by the craftsperson that is nonproductive and serves to satisfy his personal needs.
- 10.4% of the craftsperson's time was spent going back and forth obtaining tools and materials from tool box and/or truck.
- 24.2% of craftsperson's time was wasted from lack of assignments and waiting for proper equipment.

The only management involvement with the PM Team was which buildings were on the PM schedule. The fact that the craftspersons are traveling to work sites and determining the level and extent of the work to be accomplished demonstrates how lack of supervision, planning and scheduling contributes to low productivity. While some of the tasks performed encompassed legitimate preventive maintenance tasks, the majority of the window and door lubrications and cleaning lamp covers were not required.

Most of the work being done by the craftspersons in this example was regular maintenance, if not self-help, in nature. Very few of the tasks performed by the PM workers required the skill of a craftsperson. Presently, the Preventive Maintenance Shop is overstaffed, given the lack of work backlog and the skill level required to perform the work demanded.

Recommendations

Several recommendations can be made as a result of this example:

- Review the work backlog to ensure that a sufficient workload is available for scheduling. Once enough work is available, it is the responsibility of the shop foreman and supervisor to assign tasks and schedule work for each craftsperson, in order to achieve the efficient utilization of human resources.

EXHIBIT II-9

- Provide helpers in the PM shop. The fact that two craftspersons were sent on a job that should have been one craftsperson and a helper shows that management needs to improve their coordination in outlining job tasks. Because of the volume and complexity of the jobs, any misuse or mismanagement of highly skilled craftspersons can be very costly to DEH in a longer relevant range of time.
- The creation of a radio-dispatched, service-order shop would lead to quicker response and better utilization of existing resources. The single worker SO Teams concept as described in para. 3.6, page III-13, would incorporate the organization of several cross-trained maintenance mechanics who would respond to all service calls received by the work reception office, regardless of the craft nature required.
- This example also displays the need for improvement in field supervision and more importantly the need to use variance analysis to improve estimator and worker performance.

## EXAMPLE F

SHOP: Metal

Findings of Fact

- 0730 - 0732 Loading tools and supplies onto truck
- 0734 - 0740 Receiving service orders from shop foreman and obtaining locksets from shop stock
- 0742 - 0758 Making multiple keysets for locks to be replaced during the day on service orders. Also awaiting foreman's return with truck. (Foreman is using truck to drop other craftspersons off at different work sites.)
- 0800 - 0802 Waiting for return of foreman with truck
- 0804 - 0810 Loads locksets on trucks and drives to Bldg. 8303 (barracks)
- 0812 - 0814 Occupant is not in, awaiting key from building monitor
- 0816 - 0820 Job planning and laying out tools
- 0822 - 0828 Welding broken hinge
- 0830 - 0844 Material handling at job site and replacing lockset. (Eight minutes spent on two trips to truck for additional parts.)
- 0846 - 0848 Replace lockset for another building tenant
- 0850 - 0852 Takes tools to truck and does paperwork for service order
- 0854 Drives truck to next building (8302) for service order
- 0856 - 0858 Locating building monitor and awaiting glass for broken window in door
- 0900 - 0912 Drilling new holes in window frame, securing frame and installing new glass
- 0914 - 0916 Return tools to truck and complete service order paperwork
- 0918 - 0920 Drive to Bldg. 8224 (work order on loose slip of paper)
- 0922 Takes measurement for replacement door handle
- 0924 - 0928 Drive to shop

EXHIBIT II-9

0930 Pick up additional service orders from office  
0932 - 0940 Morning break  
0942 - 0946 Drive to Bldg. 8313  
0948 Change door lock  
0950 Paperwork  
0952 - 0954 Drive to secured area  
0956 - 0958 Security check  
1000 Drive to Bldg. 9122  
1002 - 1004 Awaiting instructions from occupants of compound  
1006 Drive to new facility within compound  
1008 - 1016 Locating door to rekey and changing locksets  
1018 Paperwork  
1020 - 1026 Travel to Bldg. 8270  
1028 Locating building supervisor  
1030 - 1040 Changing lockset and adjusting door hinge  
1042 Paperwork  
1044 - 1046 Travel to Bldg. 8226  
1048 - 1118 Remove door lockset and handles, drill new holes in door and install new door closures and lockset (Includes three trips to truck for additional material and tools.)  
1120 - 1122 Paperwork  
1124 - 1126 Travel to Bldg. 8113  
1128 - 1130 Awaiting instructions  
1132 - 1154 Obtaining tools and equipment, cutting metal hinges and adjusting door for fit (includes two trips to truck for additional equipment)  
1156 - 1158 Travel to shop  
1200 - 1228 LUNCH

EXHIBIT II-9

1230 - 1232 Idle initially, then organize SO work for the afternoon  
1234 - 1238 Travel to Bldg. 8118  
1240 Obtain padlock key for outside door in Bldg. 8112  
1242 Drive truck to Bldg. 8112  
1244 - 1344 Cut off padlock chain, cut out door latch set, drill holes and re weld latch set and replace lock (includes 4 trips to truck for additional equipment and material)  
1346 - 1352 Locating building monitor in 8118 to give new keys for replacement lockset (craftsman was unable to find building monitor)  
1354 - 1358 Travel to Bldg. 8416 (Gas Station)  
1400 Fueling truck  
1402 - 1404 Travel to Bldg. 8656  
1406 - 1422 Discussing scope of service order with building occupant, changes three locksets  
1424 - 1432 Travel to shop  
1434 Check office for service orders  
1436 - 1444 Afternoon break  
1446 - 1450 Travel to Work Reception to pick up service orders, then travel to Bldg. 8219  
1452 - 1454 Cut lock on freezer and tighten hydraulic door closer  
1456 Travel to Bldg. 8270 (second trip to this building today)  
1458 - 1506 Discuss work with occupant. Replace lockset on door next to door serviced in morning. HAMM ASSOCIATES believes that craftsperson responded to second service order request for work performed on morning SO. Door repaired had no defects according to occupants.  
1508 - 1512 Travel to Bldg. 8118 to deliver keys.  
1514 - 1522 Filling out time sheet and equipment utilization sheet at Bldg. 8118  
1524 - 1530 Travel to shop

EXHIBIT II-9

1532 - 1540	Restocking truck
1542 - 1544	Securing vehicle and equipment
1546 - 1550	Idle
1552	Personal cleanup at shop
1554 - 1558	Idle

Finding - DEH craftspersons are not being tasked with full workloads by shop foremen.

On several occasions DEH craftspersons were observed running out of work orders and having to return to the shop or to work reception to pick up additional service order work. In this example, the DEH craftsperson returned to the shop three times for service orders and visited work reception once. These three trips resulted in additional travel time of forty minutes for the craftsperson (3 trips to shop, 1 trip to work reception and 3 additional trips to 8200 areas where craftsperson performed SO work at 0918 hours).

Also due to a lack of available work, it was the DEH craftsperson's decision to complete paperwork for the day at 1514 hours resulting in additional idle time following his early return to the shop. (Paperwork time equal 10 minutes and idle time equals 12 minutes.)

Conclusion

As a routine practice, DEH shop foremen are requiring craftspersons to periodically return to the shop for additional work orders during the course of the work day. This was found to be the case in all service order craftsperson teams work sampled. This also occurs when IJO teams complete their tasking and available productive hours are remaining after IJO accomplishment. The majority of the service orders that were being assigned by the foreman during these return visits were not of an emergency nature and in most cases were one to two weeks old.

Recommendations

The practice of having craftspersons return for additional service orders is a major cause of loss of productivity. Shop foremen, who provide the input for shop scheduling, must be able to provide craftspersons with enough work orders to fill his available productive hours for that day. This may be accomplished in one of two ways. Since the DEH craftsperson habitually returns to the shop compound for lunch, a full morning's worth of tasking could be assigned at the beginning of the day and a full afternoon's work of tasking could be assigned following lunch break.

EXHIBIT II-9

The second way that adequate tasking could be assigned would be by field visits by the foreman to the work sites. HAMM ASSOCIATES observed foremen visiting the work sites of craftsmen being sampled in almost every instance for each DEH craft shop. If this practice is the norm for the Baumholder DEH foremen, and we have no reason to believe it is not, then these periodic visits during the day could be utilized to assign emergency work orders as well as additional work orders for SO and IJO teams nearing task accomplishment.

Either of the above mentioned methods could negate the loss of productive time that occurs when craftspersons return to the shops due to a lack of work. In this example, a total of 52 minutes was expended by the craftsperson in returning to the shop for work orders, returning to an area of the post previously serviced and idle time at the end of the day still caused by a lack of assigned work. The DEH could realize a productivity increase for this craftsperson alone of 214.9 hours annually available for service order work. (52 minutes x 248 workdays divided by 60 minutes per hour = 214.9 hours.)

## EXAMPLE G

SHOP: Preventive Maintenance, (1) A-4

Finding of Fact

- 0730 - 0732 Craftsperson arranging tools and equipment on vehicle for later use at the job site.
- 0734 Discussion with foreman
- 0736 Craftsperson planning work
- 0738 - 0740 Craftsperson idle awaiting instructions from foreman
- 0742 - 0752 Travel to Bldg. 8254
- 0754 - 0756 Securing tools and supplies from vehicle
- 0758 - 0928 Time spent by the craftsperson unclogging main drain pipe; i.e., plunging (using an approximate 15 ft. hand-held snake) and disassembling drain pipes
- 0930 - 0940 Break
- 0942 - 0950 Reassembling first floor latrine drain pipes
- 0952 - 1000 Time spent waiting for second craftsperson to flush water through drain pipe
- 1002 - 1006 Reassembling first floor latrine drain pipes
- 1008 - 1014 Waiting for second craftsperson to flush water through drain pipe
- 1015 - 1024 Reassembling second floor latrine drain pipes
- 1026 - 1028 Securing tools and equipment on vehicle
- 1030 - 1034 Continuing work on drain pipe
- 1036 - 1054 Time spent by the craftsperson cleaning up job site
- 1045 Craftsperson in discussion with foreman
- 1058 - 1104 Cleaning up job site and securing tools and materials on vehicle
- 1106 - 1116 Craftsperson filling out PM report

EXHIBIT II-9

1118 - 1124      Idle  
1126 - 1130      Craftsperson performing housekeeping chores on PM vehicle  
1132 - 1146      Continuing the filling out of PM report and securing signature  
1148 - 1150      Securing tools and materials on vehicle  
1152              Idle  
1154 - 1158      Travel to shop for lunch  
1200              LUNCH  
1230 - 1236      Travel to Bldg. 8253  
1238 - 1240      Securing tools and supplies from vehicle  
1242 - 1246      Craftsperson performing PM inspection on sink  
1248              Securing materials from vehicle  
1250 - 1302      Time spent by the craftsperson disassembling sink drain pipe, installing new drain pipe and repairing sink faucet  
1304 - 1322      Repairing A/C socket  
1324 - 1332      Repairing door hardware  
1334 - 1404      Repairing door to correct jamming problem  
1406 - 1430      Repairing door hardware  
1432 - 1440      Repairing door hardware  
1442 - 1450      Repairing and lubricating door hardware  
1452 - 1454      Waiting for door key  
1456 - 1510      Repairing door hardware  
1512 - 1544      Repairing door hinges and correcting door closing problem  
1546 - 1552      Securing tools and materials on vehicle  
1554 - 1558      Travel to shop  
1600              End of work day

**EXHIBIT II-9**

**Conclusions**

The craftsperson spent an excessive amount of time performing the task of unclogging a drain (0758 - 1104). With the use of a motorized "snake", the job time could have been significantly reduced. The craftsperson spent the remainder of the morning (until 1200) filling out paperwork and performing housekeeping-like chores on the PM vehicle. This observation represents the craftsperson's PM efforts in Bldg. 8254. No effort was made to coordinate with the Troop building manager to determine known building deficiencies; nor was an effort made to gain access to private quarters for the purpose of inspecting doors, windows, etc.

The objective of PM is to investigate maintenance problems and take corrective actions if time and craftspersons expertise permits. However, excessive time spent performing a single task, resulting from the craftsperson not having the proper tool, served as a deterrent to the craftsperson's PM productivity.

After consultation with other HAMM ASSOCIATES' personnel who work sampled the PM shop; the conclusion is that management lacks proper supervision over the craftsperson in the field. The craftsperson's desire to remain on schedule (building PM schedule) precluded a full inspection of the building mentioned above; thus, allowing building defects to go unchecked, which generally leads to an increase in service orders and building deterioration, all of which defeats the PM program.

**Recommendation**

It is recommended that the shop foreman or his designee spot check PM vehicles for proper tools, supplies and organization. It is also recommended that the shop foreman formulate a quality assurance program for the purpose of "spot checking" work recorded on craftsperson's PM reports to ensure that the work noted on reports is actually being performed.

EXHIBIT II-9

EXAMPLE H

SHOP: Plumbing A/4-6

Findings of Fact

- 0730 - 0736 Receiving instructions from supervisor  
0738 - 0740 Paperwork  
0742 - 0744 Travel to Bldg. 8547  
0746 Bringing tools to job site  
0748 - 0758 Unclogging toilet using snake  
0800 Cleaning up  
0802 - 0804 Replacing toilet  
0806 Personal cleanup  
0808 - 0816 Travel to Bldg. 8332  
0818 - 0822 Fixing a drain in enlisted club's bathroom - two persons on one person job  
0824 Clean up the job site  
0826 - 0838 Fixing a faucet in Enlisted Club cafeteria - two persons on a one person job  
0840 - 0842 Checking for further work orders in area  
0844 - 0858 Travel to Bldg. 8879  
0900 - 0916 Couldn't fix a leaky faucet and didn't have a replacement - promised to be back in afternoon  
0918 Finding another work order in area  
0920 - 0922 Travel to Bldg. 8825  
0924 - 0942 Replacing a toilet seat - self help - two persons on a one person job  
0944 Putting away tools  
0946 - 0950 Travel to shop

EXHIBIT II-9

0952 - 1002 Break  
1004 - 1006 Checking for work orders at work reception  
1008 - 1010 Travel to Bldg. 8028  
1012 - 1014 Unclog a bath tub - self help  
1016 Checking for further work orders in area  
1018 - 1020 Travel to Bldg. 8075  
1022 - 1042 Unclog a toilet with a snake  
1044 Paperwork  
1046 Travel to Bldg. 8040  
1048 - 1050 Nobody home  
1052 Travel to Bldg. 8666  
1054 - 1056 Looking for someone at Rec Center to let them in  
1058 - 1104 Travel to Bldg. 8211  
1106 - 1112 Fixing a leaking faucet  
1114 - 1116 Back to shop to get a part  
1118 - 1120 Finding part in shop stock  
1122 - 1124 Back to job site  
1126 Fixing faucet  
1128 - 1130 Travel to Bldg. 8216  
1132 Setting up tools  
1134 - 1136 Unclogging toilet with a snake  
1138 - 1140 Travel to wrong building (8301)  
1142 - 1146 Travel to Bldg. 8560  
1148 - 1150 Examining toilet  
1152 Getting snake from truck

EXHIBIT II-9

1154 - 1156 Personnel cleanup  
1158 Travel back to shop  
1200 - 1228 LUNCH  
1230 - 1232 Putting tools on truck  
1234 - 1236 Checking for emergency work orders at work reception  
1238 - 1244 Checking on use of special truck  
1246 - 1258 Travel to Bldg. 8560  
1300 - 1302 Unloading truck and putting on protective clothing  
1304 - 1318 Using snake in sewer  
1320 Personal cleanup  
1322 Putting away tools  
1324 Cleanup job site  
1326 Personal cleanup  
1328 - 1330 Travel to shops  
1332 - 1336 Talking with foreman  
1338 - 1342 Travel to Bldg. 8040 - nobody home  
1344 - 1348 Travel to Bldg. 8240  
1350 - 1358 Replacing shower heads in barracks - self help  
1400 - 1406 Travel to pick up partner  
1408 Paperwork  
1410 Travel to Bldg. 8666 (Rec Center again)  
1412 - 1428 Paperwork while coworker does work  
1430 Travel back to shops  
1432 - 1440 Break  
1442 - 1446 Idle

EXHIBIT II-9

1448 - 1452	Travel to Bldg. 8805
1454 - 1504	Fixing a running toilet
1506	Putting tools back on truck
1508	Travel
1510 - 1522	Paperwork while partner did work
1524 - 1526	Idle
1528 - 1536	Travel
1538	Paperwork
1540 - 1544	Waiting in truck while coworker does work
1546	Paperwork
1548 - 1550	Travel back to shops
1552	Idle
1554 - 1556	Personal cleanup
1558	Idle

Conclusions

Many factors combined to produce low productivity (28.3%). Two workers were often on a one person job. In these instances, one often sat idly in the truck while the other accomplished the job. On another occasion, there were two one-person jobs in the same building, but the workers did not split up. Further time was lost through having incorrect building numbers on service orders, or no specifics on the exact location of the problem in the building. No note was made on one service order that the recreation center opens at 1400 causing the workers to make two trips. The workers also spent 10.4% of the day doing self-help work. The high percentage of paperwork (28.3%) might be explained by a lack of work. The worker merely shuffled through work orders and made notations to keep busy. However, it is interesting that those work orders turned in that day were not those actually accomplished. The worker had a large stack of work orders at the end of the day and held back some, actually completed. Also, many of the stopped up toilets may be explained by insufficient amounts of toilet paper in the barracks, causing soldiers to use inappropriate paper.

**EXHIBIT II-9**

**Recommendation**

The most important aspect may be for the foreman to closely monitor service orders by collecting them at the end of the day. This will prevent workers from holding on to completed work orders and allow the foreman to better gauge exactly how much work is being accomplished daily. Stronger on-site supervision might encourage workers to split up for more than one job in the area. Work reception should be encouraged not only to screen for self help, but also to identify clearly the problem, the building, and the location in the building.

EXHIBIT II-9

EXAMPLE I

SHOP: Carpentry A/4-6

Findings of Fact

- 0730 - 0738 Picking up tools in shop and receiving instructions  
0740 - 0742 Travel to Bldg. 8314  
0744 Setting up tools at job site  
0746 Getting linoleum tiles ready  
0748 - 0752 Cleaning up seepage from between tiles installed previous day  
0754 - 0834 Worker idle - other two putting down tile  
0836 - 0838 Mixing adhesive  
0840 - 0852 Applying adhesive to floor  
0854 - 0916 Waiting for one worker to run back to shop to get a saw  
0918 - 0928 Installing baseboards  
0930 - 0940 Break  
0942 - 1000 Installing baseboards  
1002 - 1004 Putting away some tools  
1006 Bringing more baseboards from other end of hall  
1008 - 1024 Installing baseboards  
1026 - 1028 Restroom  
1030 Getting tools ready  
1032 - 1046 Idle while other two put down tiles  
1048 - 1058 Cutting and installing baseboards  
1100 - 1106 Cleaning up  
1108 Idle  
1110 - 1112 Cleaning up and putting away tools

EXHIBIT II-9

1114 - 1152 Trying to get in touch with foreman to get ride back to shop  
1154 - 1156 Travel to shop  
1158 Unloading tools  
1200 - 1228 LUNCH  
1230 Loading new tiles on truck  
1232 - 1236 Travel back to Bldg. 8314  
1238 Receiving instructions from foreman  
1240 - 1242 Waiting for coworker to bring tools from truck  
1244 - 1318 Preparing floor for tiles  
1320 - 1322 Cleaning up  
1324 Restroom  
1326 - 1336 Trying to call shop for transportation - ended up taking a taxi  
1338 Travel to shops  
1340 Unloading truck  
1342 - 1348 Receiving instructions from foreman  
1350 - 1406 Getting wood from wood pile for use in making picnic tables  
1408 - 1410 Measuring wood  
1412 - 1414 Bringing wood to work tables  
1416 - 1428 Cutting wood  
1430 - 1440 Break  
1442 - 1448 Cutting wood  
1450 - 1520 Running wood through planing machines  
1522 Restroom  
1524 - 1546 Running wood through planing machines

EXHIBIT II-9

1548 - 1558 Cleanup and idle

Work Distribution

Direct Productive	38.5%
Indirect Productive	30.8%
Non-Productive	30.7%
	<u>100.0%</u>

Major Problem Areas:

Awaiting Transportation	9.5%
Awaiting Tools	3.9%
Idle-Lack of Work at Job Site	8.4%
	<u>21.8%</u>

- 3.2 manhours were wasted because workers could not get in touch with shop for transportation or tools.
- An additional 40 minutes was wasted due to an insufficient amount of work at the job site.

This example demonstrates the loss of productive time due to a lack of vehicles and an insufficient backlog. The lack of vehicles caused workers to wait at the job site for transportation back to the shop. The lack of work backlog may have caused the foreman to send three craftspersons on a two person job.

Recommendations

- Request an increase in the number of trucks. More trucks would reduce the amount of time spent waiting on transportation.
- Build up a backlog of work orders to ensure that craftspersons can be kept busy at job sites.

These suggestions, along with better planning, would reduce the amount of idle time and job preparation time.

EXHIBIT II-9

EXAMPLE J

SHOP: Paint (2) A-4

Findings of Fact

- 1230 Both workers receiving instructions from supervisor
- 1232 - 1240 Both preparing paint mixtures for later use at job site
- 1242 One A-4 handling materials in shop; other idle
- 1244 - 1246 Travel to job site; Bldg. 8238
- 1248 - 1250 Both obtaining tools and materials from truck
- 1252 Both craftspersons began painting toilet stalls on 1st floor for IJO #EX00044 on 1st and 2nd Floor of Military Police Building
- 1254 One A-4 painting bathroom stalls; other A-4 obtaining more thinner from truck
- 1256 - 1306 Both workers still painting toilet stalls
- 1308 - 1314 One A-4 still painting toilet stalls; other A-4 obtaining more tools from truck
- 1316 - 1356 Both craftspersons are painting bathroom stalls
- 1358 - 1400 Both workers were waiting for female MPs to use bathroom
- 1402 - 1436 Both craftspersons are painting stalls
- 1438 - 1446 Both on break
- 1448 Both workers were idle
- 1450 - 1516 Both workers finished painting five (5) toilet stalls on 1st floor
- 1518 Movement from 1st floor to 2nd floor of job site carrying tools (NOTE: Only to find out that troops already painted stalls on 2nd floor)
- 1520 Both workers putting away tools and paint
- 1522 - 1524 One A-4 still putting away tools and paint; other A-4 cleaning up job site

EXHIBIT II-9

1526 Both craftspersons cleaning themselves at job site  
1528 One craftsperson still washing his hands; other craftsperson using restroom  
1530 One worker using restroom; other A-4 putting away materials on truck  
1532 - 1534 Travel back to shop  
1536 Both unloading tools and paint from truck  
1538 One A-4 washing his hands; other still unloading materials off truck  
1540 Both putting away tools and paint in shop  
1542 - 1544 One craftsperson doing paperwork; other A-4 still putting away materials in shop  
1546 - 1550 One A-4 turning in paperwork; other worker putting away tools and paint  
1552 One worker turning in paperwork; other A-4 cleaning up shop  
1554 - 1556 One A-4 turning in paperwork; other A-4 washing up for end of work day  
1558 Both cleaning up for end of work day  
1600 End of Day

Conclusions

This is an excellent example of two craftspersons doing a job that is self-help in nature. This appeared to be a task performed not requiring a high level of craft skills. As mentioned in this example the two craftspersons were doing a task that the troops had already been instructed to do. As a matter of fact the 2nd floor bathroom stalls had already been painted by the soldiers. The work requests are not being screened for self help.

Recommendations

DEH should redefine the nature of job tasks for self help, maintenance mechanic and craftsperson categories. DEH should also require the work reception area and/or shop foremen to screen all work requests for self hep items.

## EXAMPLE K

SHOP: Plumbing

Findings of Fact

- 0730 - 0734 Receiving instructions and work orders from foreman
- 0736 - 0740 Travel to Bldg. 8012
- 0742 Taking tools and materials into boiler room
- 0744 - 0748 First craftsperson informing building occupants of water stoppage. Second craftsperson brings remaining supplies into building.
- 0750 - 0754 First craftsperson informs remaining tenants of water stoppage. Second craftsperson begins removing insulation from pipes
- 0756 - 0832 After securing hot water line, craftsperson heats joints, cuts and disassembles clogged water line.
- 0834 - 0840 Measuring and cutting replacement piping
- 0848 - 0852 Job planning and taking measurements for replacement pipe
- 0854 - 0912 Cutting replacement piping and installing a section of piping
- 0914 Taking measurements for next pipe section
- 0916 - 0918 Installing pipe section
- 0920 Taking measurements for remaining section replacements
- 0922 - 0926 Travel to shop
- 0928 Craftsperson washing up in shop
- 0930 - 0938 Morning break
- 0940 - 0942 Getting materials from shop stock
- 0944 - 0950 First craftsperson goes to supply for pipe, second craftsperson joining and fitting elbows in shop
- 0952 - 1014 Measuring, threading and cutting pipe to proper dimensions

EXHIBIT II-9

1016 - 1018 Personal cleanup and loading tools and equipment onto truck  
1020 - 1022 Travel to Bldg. 8012  
1024 Taking equipment and materials to work site  
1026 - 1048 Installing replacement pipe  
1050 - 1104 First craftsperson returns to shop to cut additional piping (previous dimensions slightly off). Second craftsperson cleaning up work site, then idle while awaiting return of first craftsperson  
1106 - 1118 Installing replacement pipe (foreman visits job site)  
1120 - 1126 First craftsperson waits for second to cut pipe while cleaning work site  
1128 - 1136 Installing pipe  
1138 - 1140 Measuring for remaining replacement piping  
1142 - 1144 Cutting horse hair away from pipe joints  
1146 - 1150 Cleanup and return tools and excess piping to truck  
1152 - 1156 Travel to shop  
1158 Personal cleanup at shop

EXHIBIT II-9

EXAMPLE K (continued)

SHOP: Carpentry

Findings of Fact

- 0730 - 0732 Receiving instructions from foreman  
0734 - 0740 Travel to Bldg. 8665 with foreman  
0742 - 0746 Foreman and craftsman scope out service order. (repair flooring in food storage area)  
0748 - 0750 Travel to supply warehouse  
0752 - 0758 Awaiting service in supply area (no materials picked up)  
0800 Return to shop  
0802 - 0804 Receiving additional instructions from foreman  
0806 Return to warehouse with second craftsman  
0808 - 0814 Obtaining materials from supply warehouse  
0816 - 0822 Gathering tools and equipment in shop  
0824 Additional instructions from foreman  
0826 - 0832 Foreman and craftsman return to supply for more materials  
0834 - 0838 Travel to Bldg. 8665  
0840 - 0852 Offloading materials and carrying materials to second floor  
0854 - 0918 Removing obstructions then removing existing flooring  
0920 - 0924 Clean area and measure for replacement flooring  
0926 - 0932 Install new flooring  
0934 - 0944 Morning break (foreman returns)  
0946 Measuring flooring  
0948 - 0958 Cutting and installing new flooring  
1000 Measuring flooring  
1002 - 1014 Cutting and installing new flooring

EXHIBIT II-9

1016	Measuring flooring
1018 - 1030	Cutting and installing final part of patch
1032 - 1036	Clean up area and relocate tools and material to next patch
1038 - 1040	Removing existing flooring
1042 - 1048	Job planning and relocating power saw
1050 - 1052	Remove rotten flooring
1054 - 1058	Planning extent of cut for floor patch
1100 - 1114	Cutting and removing existing flooring
1116	Waiting for second craftsperson to remove nails from studs
1118 - 1124	Cutting away remaining rotted flooring
1126 - 1128	Planning replacement patch
1130 - 1134	Obtaining remaining materials from first floor
1136	Additional planning
1138 - 1144	Staging materials for patch of flooring
1146 - 1154	Cleaning up work area
1156	Waiting for foreman to pick up craftsmen
1158	Travel to shop

## EXHIBIT II-9

Finding - These two shop examples show excessive amounts of time spent for job planning and material staging for service order work by DEH craftspersons.

On numerous occasions while observing DEH craftspersons performing major service order tasks (greater than 16 hours duration), HAMM ASSOCIATES discovered that the craftspersons were spending available productive hours in job planning and acquiring material measurements in order to perform the service order work. This time entails scoping out the service order, coordinating the repair and any work area constraints and requirements with the building occupant(s), return trips to the shop and/or supply warehouse, and picking up and staging materials for job accomplishment. In the examples shown, the plumbing crew expended 22 minutes in performing job planning and recording measurements, 12 minutes in material handling at the shop and in supply and 30 minutes in travel to shop and back to the job site. The carpenter spent 28 minutes in job planning, 36 minutes in material staging and 36 minutes traveling. These observations all occurred while performing work sampling during the morning (4.5 hours).

### Conclusion

While service order work historically requires few labor hours and minimal shop stock to complete the repairs, on occasion service orders may become more complex and require extensive manpower as well as preliminary planning and material staging. When preliminary planning and material staging are required, these duties are presently being performed by the DEH craftspersons. Although most of the craftspersons observed are capable of performing scoping and planning. It decreases the amount of productive time available for doing the actual work. In the two examples shown, the time spent in planning, travel and material handling breaks out as follows:

Planning	50 minutes
Material Handling	36 minutes
Travel	36 minutes
TOTAL	2 hours 2 minutes or 22% of morning both crews

Realizing that practically all maintenance and repair jobs are going to require planning and material handling, it is felt that the amounts of time spent in the above three categories on major service order work is excessive.

### Recommendations

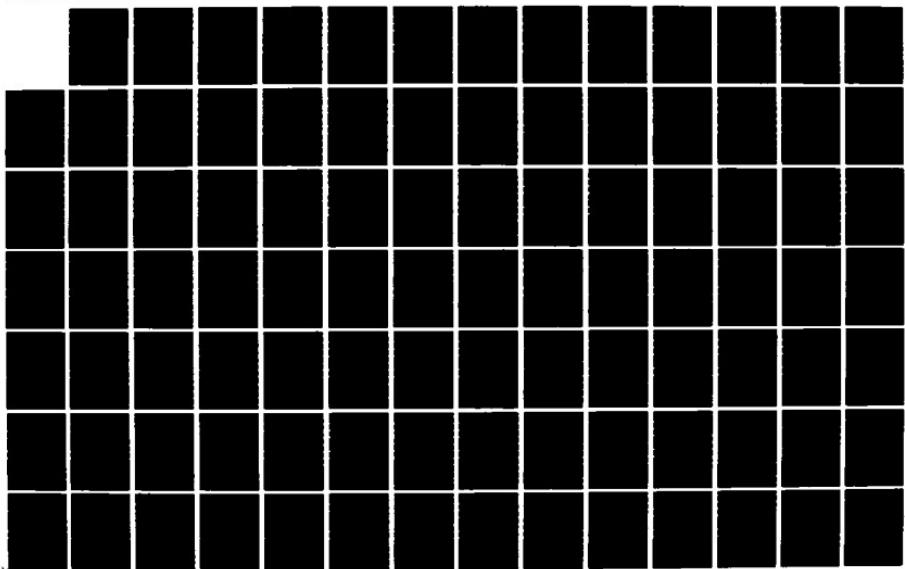
Major service orders (over 16 hours) are more the exception rather than the rule within an activity's service order backlog. Most service orders will require two hours or less of effort and material usually carried as truck stock. It is safe to assume that major service order work comprises less than 20% of the total service order backlog for the installation.

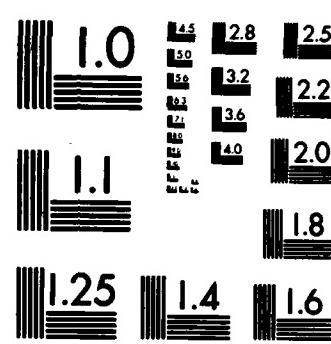
AD-A150 937 PRODUCTIVITY REVIEW AND ANALYSIS OF DIRECTORATE OF 2/3  
ENGINEERING AND HOUSING. (U) HAMM (E L) AND ASSOCIATES  
INC VIRGINIA BEACH VA 30 NOV 84 DACA65-84-C-0111

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MICROCOPY RESOLUTION TEST CHART  
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EXHIBIT II-9

Therefore, because of the lesser frequency of occurrences HAMM ASSOCIATES recommend that the preliminary planning, repair and material dimensioning and, where feasible, material staging for those service orders be accomplished by the shop foremen and/or assistant shop foremen. Having this performed at the shop management level will serve a two-fold purpose. First, it will reduce the amount of time DEH craftspersons are spending in scoping service order jobs and returning to the shop or warehouse for materials, as mentioned above. Secondly, it will provide the shop management personnel with better insight of the manpower required for job accomplishment and this knowledge can be utilized in effectively assigning sufficient workload to the DEH craftspersons. Most of the service orders in question will run over one-half day for two man crews and over one full day for a one man crew and prior knowledge of this requirement will ensure that adequate workload can be assigned at the start of work after lunch or at the beginning of the next day following service order commencement.

EXHIBIT II-9

EXAMPLE L

SHOP: Preventive Maintenance

Findings of Fact

- 0730           Craftspersons are late arriving for start of work day
- 0732 - 0736   One craftsperson turns in paperwork from prior day's work. Second craftsperson loads tools and materials onto truck - then awaits return of first craftsperson.
- 0738 - 0742   Travel to Bldg. 8544
- 0744 - 0746   Taking tools and materials from truck to job site
- 0748 - 0752   First craftsperson repairing door hinge, oils and aligns door. Second craftsperson replacing light switch.
- 0754 - 0802   First craftsperson tightening and lubricating window closures and hinges. Second craftsperson cleaning fluorescent fixtures and changing tubes.
- 0804 - 0812   First craftsperson tightening and lubricating window closures and hinges. Second craftsperson changing light switch.
- 0814 - 0826   First craftsperson tightening and lubricating window closures and hinges. Second craftsperson replaces bulb in exit sign and repairs electrical outlet.
- 0828 - 0834   First craftsperson aligns dining table at request of tenant. Second craftsperson repairing electrical outlet.
- 0836 - 0854   First craftsperson tightening and lubricating window closures and hinges. Second craftsperson repairs light fixture in freezer, repairs an outlet and replaces ballast in fluorescent fixture.
- 0856 - 0906   First craftsperson repairs tray cart at request of tenant. Second craftsperson replacing fluorescent lights.
- 0908 - 0914   Foreman visits work site. First craftsperson continues cart repair. Second craftsperson repairs wall outlet. Foreman leaves.
- 0916 - 0920   Both craftspersons trying to locate panel box circuit to outlet being repaired by second craftsperson.

EXHIBIT II-9

0922 - 0926 First craftsperson tightening and lubricating window closures and hinges. Second craftsperson replacing wall outlet.

0928 - 0934 First craftsperson repairing restroom stall. Second craftsperson mixes plaster and patches hole in wall surrounding replacement outlet.

0936 - 0952 First craftsperson takes morning break. Second craftsperson performing outlet repair

0954 - 1000 First craftsperson tightening and lubricating windows. Second craftsperson finishes outlet repair and wall patching and cleans work area.

1002 - 1014 First craftsperson aligns and lubricates door and repairs window screen. Second craftsperson takes morning break.

1016 - 1024 First craftsperson continues screen repair. Second craftsperson inspects and tightens panel box.

1026 - 1048 First craftsperson repairing striker plate in door. Second craftsperson replaces fluorescent ballast and tubes, checks an inoperative wall outlet and replaces an electric switch.

1050 - 1112 First craftsperson drilling holes in metal door and refastening sides together. Second craftsperson replaces light switch, replaces exit sign bulb, repairs and cleans wall outlet.

1114 - 1124 First craftsperson finishes repair in metal door. Second craftsperson inspecting lights and electrical outlets.

1126 - 1140 First craftsperson replaces door stopper. Second craftsperson replaces exit and fluorescent lights.

1142 - 1150 First craftsperson finishes door stopper replacement. Second craftsperson takes tools and materials back to truck.

1152 - 1154 Both craftspersons taking tools and materials to truck

1156 - 1158 Travel to shop

1200 - 1228 LUNCH

1230 First craftsperson waits for second craftsperson to obtain and load materials onto truck.

EXHIBIT II-9

- 1232 - 1236 Travel to Bldg. 8544
- 1238 Take tools and materials from truck to building
- 1240 - 1258 First craftsperson repairs and aligns door. Second craftsperson replacing fluorescent tubes
- 1300 - 1306 First craftsperson repairs door stopper. Second craftsperson repairs light fixture.
- 1308 - 1326 First craftsperson repairs water drain and faucets. Second craftsperson installing new light fixture in restroom.
- 1328 - 1330 Tenant upstairs informs craftsperson of SO to fix water line in women's restroom. No action taken.
- 1332 - 1344 First craftsperson finishes faucet repairs. Second craftsperson changes incandescent porch light, then idle while waiting for first craftsperson to finish.
- 1346 - 1348 Craftspersons gather tools and materials and walk to offices on second floor
- 1350 - 1354 First craftsperson tightens and lubricates window closures and hinges. Second craftsperson questions tenants on electrical problems.
- 1345 - 1406 First craftsperson tightens and lubricates windows. Second craftsperson tacks wiring and repairs outlet.
- 1408 - 1420 First craftsperson tightens and lubricates windows. Second craftsperson returns to truck for materials.
- 1422 - 1440 First craftsperson caulking and tightening windows. Second craftsperson mixes plaster and patches chips in wall.
- 1442 - 1452 First craftsperson checks water stoppage problem in women's restroom. Second craftsperson tacks wiring in conference room then assists in checking water supply.
- 1454 - 1318 First craftsperson tightens and lubricates door handles and hinges and window closures and hinges
- 1320 - 1344 First craftsperson caulking, tightening and lubricating doors and windows. Second craftsperson cleans tools and plaster container, repairs hinge and tacks electrical wiring.

EXHIBIT II-9

- 1346 - 1348 First craftsperson aligns and tightens attic door. Second craftsperson mixes plaster and patches cracks in wall.
- 1350 - 1354 Gathering tools and materials and returning them to the truck.
- 1356 - 1358 Travel to shop.

## EXAMPLE L (continued)

SHOP: Entomology

Findings of Fact

- 0730 Receiving instructions from supervisor
- 0732 - 0734 Loading equipment and materials onto truck
- 0736 - 0740 Travel to Bldg. 8401
- 0742 - 0746 Idle. Unable to gain entry to building
- 0748 - 0750 Travel to 8408A (not open - Bldg. opens at 1000 hours)
- 0752 - 0754 Two craftspersons changing two bait traps in building.
- 0756 One craftsperson waits for other to use restroom
- 0758 - 0800 Travel to Bldg. 8413
- 0802 Two craftspersons change one bait station
- 0804 - 0806 Travel to Bldg. 8423
- 0808 - 0810 Two craftspersons change two bait stations. Unable to change bait station upstairs.
- 0812 - 0816 Travel to Bldg. 8475
- 0818 Traps covered by warehouse pallets
- 0820 - 0822 Two craftspersons change one bait station and install another
- 0824 - 0826 Travel to Bldg. 8499
- 0828 Two craftspersons change one bait station
- 0830 - 0836 Travel to Bldg. 8544 (drove past Bldgs. 8413 and 8408)
- 0838 - 0842 Two craftspersons change two bait stations and obtain tenant signature
- 0844 - 0846 Travel to Bldg. 8541
- 0848 - 0852 Two craftspersons change two bait stations and obtain tenant signature
- 0854 - 0900 Travel to Bldg. 8656

EXHIBIT II-9

0902 - 0904 Two craftspersons change two bait stations  
0906 - 0908 Travel to Bldg. 8665  
0910 - 0914 Two craftspersons change three bait stations  
0916 Walk around building to Sound Shop  
0918 - 0924 Two craftspersons change four bait traps and obtain tenant signature  
0926 - 0928 Travel to Bldg. 8661  
0930 Taking materials to work site  
0932 - 0934 Two craftspersons changing two bait stations  
0936 - 0948 Morning Break  
0950 - 0954 Travel to Bldg. 8401 (2nd visit)  
0956 - 1006 Two craftspersons change three bait stations, install one bait station and obtain tenant signature  
1008 - 1010 Drive truck to other side of bldg. (Snack Bar)  
1012 - 1014 Two craftspersons change two bait stations and obtain tenant signature  
1016 Travel to Bldg. 8408A (2nd visit)  
1018 - 1020 Two craftspersons change one bait station  
1022 - 1024 Travel to Bldg. 8575  
1026 - 1034 Two craftspersons change six bait stations and obtain tenant signature  
1036 - 1048 Travel to Bldg. 8895  
1050 - 1054 Two craftspersons change two bait stations and obtain tenant signature  
1056 - 1100 Travel to Bldg. 8879  
1102 Two craftspersons change one bait station and obtain signature  
1104 Walk to Bldg. 8881

EXHIBIT II-9

1106 - 1110 Two craftspersons change two bait traps and obtain signature  
1112 - 1124 Travel to Bldg. 8684  
1126 - 1128 First craftsperson sprays pesticide on dumpster. Second craftsperson mixes pesticide in second canister  
1130 Second craftsperson drives truck to Bldg. 8605  
1132 - 1134 First craftsperson mixes pesticide while second craftsperson sprays dumpster  
1136 Travel to Bldg. 8661 (2nd visit)  
1138 - 1144 Two craftspersons spraying dumpsters  
1146 Travel to Bldg. 8658  
1148 Two craftspersons spraying two dumpsters  
1156 - 1158 Travel to shop  
1200 - 1228 LUNCH  
1230 Receiving instructions from supervisor  
1232 - 1236 Travel to Bldg. 8691 & 8692  
1238 - 1244 First craftsperson sprays dumpster while second craftsperson mixes pesticide  
1246 Travel to Bldg. 8693  
1248 Two craftspersons spray dumpster  
1250 Travel to Bldg. 8697  
1252 - 1254 Two craftspersons spray one dumpster. One craftsperson stops to mix pesticide.  
1256 - 1258 Travel to Bldg. 8687  
1300 - 1302 Two craftspersons spray dumpster  
1304 Travel to Bldg. 8686  
1306 Two craftspersons spray dumpster  
1308 Travel to Bldg. 8680

EXHIBIT II-9

1310 - 1312 Two craftspersons spray dumpster  
1314 - 1316 Travel to Bldg. 8670 (drop off one craftsperson)  
1318 Second craftsperson drives to Bldg. 8669. First craftsperson sprays dumpster at 8670  
1320 - 1322 First craftsperson sprays dumpster at Bldg. 8669. Second craftsperson walks to Bldg. 8664  
1324 - 1328 First craftsperson travels to Bldg. 8653. Second craftsperson sprays dumpster at 8665 and walks to 8656.  
1330 - 1334 First craftsperson sprays dumpster at 8653, then refills canister. Second craftsperson sprays dumpster at 8656 then walks up to 8653 and sprays that dumpster.  
1336 - 1340 Travel to Bldgs. 8309 & 8305  
1342 - 1346 Spraying dumpsters, mixing pesticide  
1348 Travel to Bldgs. 8304 & 8303  
1350 Two craftspersons spraying dumpster  
1352 - 1354 Drop first craftsperson off at Bldg. 8370, travel to Bldg. 8312  
1356 - 1358 Spraying dumpsters  
1400 Mixing pesticide  
1402 Travel to Bldgs. 8313 & 8314  
1404 - 1406 Spraying dumpsters  
1408 - 1410 First craftsperson spraying dumpster, second craftsperson idle  
1412 Travel to Bldgs. 8316 & 8317  
1414 - 1416 Spraying dumpsters, refilling canisters  
1418 Travel to Bldg. 8309  
1420 - 1424 Two craftspersons spraying one dumpster  
1426 - 1428 Personal cleanup

EXHIBIT II-9

1430 - 1432 Drop off first craftsperson at Bldg. 8308, travel to Bldg. 8320

1434 Spraying dumpsters

1436 - 1438 First craftsperson idle, second craftsperson spraying dumpster

1440 - 1442 Drop off first craftsperson at Bldg. 8348, travel to Bldg. 8324

1444 - 1448 First craftsperson sprays dumpster then walks up to Bldg. 8324. Second craftsperson sprays dumpster at 8324

1450 Travel to Bldg. 8329

1452 - 1454 Two craftspersons spray one dumpster

1456 - 1500 Travel to Supply Storage Compound

1502 Two craftspersons spray one dumpster

1504 - 1508 First craftsperson fills canisters, second craftsperson idle

1510 - 1518 Travel to Bldg. 8334

1520 - 1524 Spraying dumpsters

1526 Travel to Bldg. 8347

1528 - 1530 Two craftspersons spray one dumpster

1532 - 1536 Drop first craftsperson off at Food Box, travel to Bldg. 8354

1538 - 1540 Spraying dumpsters

1542 - 1548 Travel to shop

1550 Put away material and equipment

1552 - 1554 Personal cleanup

1556 - 1558 Idle

EXHIBIT II-9

Finding - Standing Operations Order and Individual Job Order work is not being efficiently organized or supervised by Shop Foremen.

HAMM ASSOCIATES have cited two work sampling examples to assist in justifying this finding. The first example shows the preventive maintenance work crew entering a dining facility and determining the level and extent of the work to be accomplished. While some of the tasks performed encompassed legitimate preventive maintenance type tasks, the majority of the window and door lubrication was unwarranted and therefore unnecessary. Occupants of the facility informed the work sampler that the PM crew had not spent more than two hours in the facility before this day's work sampling. HAMM ASSOCIATES also observed that the tasks being accomplished by the PM crew were not being recorded for record keeping nor were customer requests for service beyond PM being recorded for transcription onto service orders or individual job orders.

In the second example, HAMM ASSOCIATES observed two members of the pest control crew changing bait stations for the majority of the morning observations. This tasking could clearly have been performed by a single craftsperson. We also observed multiple trips to the same building and criss-crossing of the installation in accomplishing the assigned tasks. This contributed to the high percentage of travel time observed for this day's work sampling (208 out of 480 observations or 43% of an eight hour work day).

Conclusions

It is fairly obvious in the two cases stated above that although DEH may assign the frequencies of task accomplishment, the individual craftspersons are responsible for the organization and selection of the actual tasks performed.

In the case of the PM crew, the only management or supervision being provided is the knowledge of which building the craftspersons are actually working in. The tasks being performed, tenant service order requests, and those tasks not within the PM scope are not being recorded by the PM crew and forwarded to management in accordance with U.S. Army TM 5-610 "Preventive Maintenance Facilities Engineering Buildings and Structures". This deviation from the requirements of the technical manual also will hinder workload analysis and record keeping when the activity converts to the Integrated Facilities System (IFS) mode of data collection.

In the example shown for Entomology, it is obvious that very little work organization or planning was performed by either the shop foreman or the DEH craftsperson because of the multiple trips to the same buildings within the containment area. There is no reason known to this organization why changing of bait traps and spraying of dumpsters could not be performed simultaneously while at a facility requiring both services. HAMM ASSOCIATES understands that because of current vehicle

EXHIBIT II-9

limitations, that instances of two men on a one man job will occur. However, it is felt that more efficient planning of the work effort would result in a substantial decrease in the travel time currently being incurred by this shop.

Recommendations

For the Preventive Maintenance crew, HAMM ASSOCIATES recommends the adoption of the "Inspector-Team Concept of Operations" system of preventive maintenance as outlined in U.S. Army TM 5-610, para. 3-5. This system uses an Inspector who operates in advance of the PM crew and allows the building condition to be readily determined, maintenance needs outlined and work identified. In addition to reducing the actual time spent to accomplish PM, this system will also provide a mechanism for record keeping of maintenance tasks performed by the PM crew as well as a liaison (Inspector) between the DEH and customer activities to address those items outside the realm of preventive maintenance. This system also puts management back in control of the work effort being assigned to their PM crews.

We recommend that the Entomology Shop implement a system which provides for total pest control services for a given facility be provided during a single inspection cycle. Vehicle restraints require two and sometimes three craftspersons per truck, therefore one craftsperson could perform the changing of bait stations while another sprays dumpsters while another provides roach and insect control. For those services not occurring on the cycle, we recommend centralized positioning of the DEH truck, and craftspersons splitting the workload for that cantonment area. For example, instead of two craftspersons changing bait stations in Bldg. 8401, 8408 8413 and 8408A together, one craftsperson could change the stations in 8408 and 8408A and the other for 8401 and 8413. The close proximity between buildings and weight of equipment and materials for task accomplishment does not lend itself to utilization of the DEH truck. These two recommendations for Pest Control Services will substantially reduce the amount of travel time presently occurring within this shop.

SECTION III  
\* \* \* PROCESS ANALYSIS \* \* \*

**3.0 INTRODUCTION**

This section includes an analysis of the processes and procedures which are basically the responsibility of the Engineer Resources Management Division (ERMD) to control and those programs/processes on which statistical analysis should be performed by ERMD for use by DEH management.

**3.1 Sick Leave**

A. Finding. Excess sick leave in the Baumholder Military Community DEH in a recent 12 month period amounted to 29,929 person-hours.

Data derived from the Performance and Productivity Control System (PPCS) Reports, USAREUR Reg. 5-20, for the months of July 1983 through June 1984 reveal the following breakdown of sick leave hours:

	<u>Sick Leave as a Percent of Total Paid Hours</u>	<u>Avg. Annual Sick Leave Per Worker</u>
<u>Sub Group A (B&amp;G and Utilities Division Shops)</u>		
Sub FE Maintenance Shops	7.47	155.3
Buildings & Grounds Div Shops	8.89	184.9
Utilities Div. Shops (less Plant opns)	6.82	141.9
Utility Plant Operations	3.10	64.5
Sub Group Total	6.87	142.9

Sub Group B (Overhead Shops)

B&G & Utilities Div and Branch Offices	2.58	53.7
ERMD	6.70	139.4
EP&SD	1.89	39.4
Supply Storage & Maintenance Branch	5.59	116.2
Fire Protection Division	2.09	43.4
Admin Office	20.37	423.6
Energy & Environmental Office	2.91	60.6
Operations Office	1.21	25.1
DEH Office	0	0
Sub Group Total	4.13	85.9
TOTAL BOTH SUB GROUPS	6.15%	128.0 HRS

Based on current shop rates, excess sick leave represents a cost to the Government of \$268,278 or a loss of approximately (29,929/1,686) 17.8 person years of time that would otherwise be available for productive work. Detailed datum is presented in Exhibit III-1, page III-21. A ranking of shops by sick leave usage is provided in Exhibit III-2, page III-24.

**B. Conclusion.**

Information provided by Mr. Ullrich, Heidelberg CPO, at the USAISAE inbrief shows that sick leave usage in the Baumholder Military Community averaged 91.83 hours per person in 1983 and that the 1984 sick leave goal is 95 hours. Viewed on a community basis, Baumholder is within target goals. However, it is considered prudent that Directorates and organizational elements of the Directorates individually strive to meet these goals. The datum presented in the foregoing finding indicates that elements of the DEH are using sick leave far in excess of the goals and that certain employees may be abusing the sick leave program. A striking example of this is shown in a comparison of utility plant operating personnel with other Building and Grounds and Utilities Division shops.

Although demographic data was not analyzed, it is unlikely that plant operators (who represent approximately 23 percent of the total Sub Group A hours analyzed) have significantly different characteristics that would account for the large variance in sick leave usage.

Past studies conducted by HAMM ASSOCIATES have found that use of sick leave by DEH shops (Sub Group A) varies considerably from shop to shop, but that taken as a whole the shops exceed Army Installation Command goals by significant amounts. Shown below for comparison purposes are data on several recently completed productivity studies at Army installations in CONUS.

	X	Y	Z	<u>Baumholder</u>
Total Paid Hours	423,881	868,772	353,713	1,094,069
Sick Leave Hours	22,276	50,554	22,222	75,140
Sick Leave %	5.26	5.82	6.28	6.87
Hours/Worker/Annum	109.3	121.0	130.7	142.9

In CONUS, where installations are/will be reviewed under the Commercial Activities (CA) program, high sick leave represents a significant disadvantage to the Government. Although Baumholder is not currently under a CA or similar program, high usage of sick leave has the same negative impact, i.e., reduced hours available for productive work.

While it is recognized that much of the sick leave is justified, there will occur instances of abuse in any organization. There will always be an interpretation by some employees that sick leave can be utilized for other than intended. Reduction of sick leave is one area in which the individual employee can make a significant contribution to increased productivity. Transferring the excess sick leave time into

time available for productive work is equivalent to an additional 15.9 personnel in the (Sub Group A) workforce.

C. Recommendations. That renewed managerial emphasis be placed on reducing sick leave. It is recommended that:

- The DEH communicate to the workers the effect that excessive sick leave usage has on the productivity levels of the Directorate.
- DEH management implement a procedure to review the PPCS Reports (recommend MESB) each month and review with the foreman of shops having excessive sick leave usage, the effectiveness of their sick leave administration. (USAREUR Pam 690-80 places the responsibility for monitoring sick leave and correction of any abuse on the supervisor.) This procedure should include all DEH elements. A suggested graph is shown in Exhibit III-3, page III-25.
- A program of employee awards/commendations be developed to provide visibility to employees who minimize sick leave usage.

### 3.2 IJO Variance Analysis

Formal followup procedures should be instituted to capitalize on the completed IJO variance analysis data developed by the ERMD Scheduler.

A. Finding. The ERMD Scheduler calculates the individual shop effectiveness on their respective phases of each completed IJO and logs this data by shop by quarter. He also requires the shop foremen to annotate on the completed file copy the reasons the actual performance was greater than +10% of the estimate. No formal followup procedures are in effect to use this information as a tool for either shop or P&E performance improvement.

Exhibit III-4, page III-26, is a summary of the data maintained by the Scheduler.

B. Conclusion. For ease of analysis the data contained in the percent columns in Exhibit III-4 is displayed in bar graph format by shop in Exhibits III-5 through III-9, beginning on page III-27. As of the

date of the on-site visit all shops reported were overall between 90 to 110% effective (Exhibit III-5, page III-27). However, the Carpentry Shop and Water Plants were both at the extreme limits. An analysis of the jobs completed by these two shops specifically should show what corrective measures are necessary to ensure the work performed remains within acceptable limits. Of concern is the amount of work completed which is greater than  $\pm 10\%$  of the estimate. (Exhibits III-6 and III-7, pages III-28 and III-29 respectively). Over 25% of the jobs completed are out of the acceptable range. Exhibit III-8, page III-30, shows the percent of phases completed within the acceptable range of effectiveness.

Also of concern is the amount of work reported completed exactly as estimated. As shown on Exhibit III-9, page III-31, 43.3% fall into this category. This is an indication that the foremen may not be reporting what actually is happening in their shops. In order to work at improving productivity, accurate reporting of shop performance is mandatory. A hazard with manual record keeping systems is that it is easier to manipulate data in order to make oneself look good. By reporting accurate data and taking the necessary actions to improve on these statistics is more important/impressive in the long run and may eventually save jobs by becoming more efficient.

C. Recommendations. A monthly variance analysis summary should be prepared by the Management Engineering Systems Branch and distributed in accordance with DA PAM 420-6, paragraph 5-5b. The importance of accurately reporting work performance should be emphasized. By creating a false picture of looking good when actually there is room for improvement is counterproductive.

### 3.3 Scheduling

Revised shop scheduling procedures will improve shop effectiveness and efficiency.

A. Finding. The following was observed at the preliminary schedule meeting held weekly at 1300 on Wednesdays.

- Attendees wander in late
- No order to the meeting
- Several side conversations going on at once
- Random issues discussed with no apparent relationship to proposed schedule
- No specific discussion of what work is proposed for the following week
- Except for ERMD Chief, no other division chief or the DEH or Deputy DEH was in attendance

The Scheduler meets individually with shop foremen beginning Thursday morning to discuss and formulate the next week's schedule. Exhibit III-10, page III-32, is an analysis of five weeks schedules. Although 99.3% of the hours available for IJ0s were expended on IJ0s only 56.8% of the hours scheduled for each week were actually worked as scheduled. A shop by shop summary of the hours worked versus originally scheduled is shown in Exhibit III-11, page III-37.

B. Conclusion. As currently conducted the preliminary schedule meeting appears to have little or no impact on the Scheduler's planning. Conducted properly this meeting should be very productive and be one of the most important weekly occurrences as far as shop productivity is concerned. It is also apparent that the weekly schedule has little or no meaning in the shops. This is a result of too many people having the authority to change schedules. Only the Director, Deputy Director or the

Chief of ERMD should have the authority to revise weekly schedules after they have been approved. Another cause for breaking schedules could be poorly prepared IJ0s. This will be very apparent if variance analysis of completed work is performed as discussed in paragraph 3.2, page III-4. Exhibit III-12, page III-38, is an excerpt from the Facilities Engineering, Items of Interest, Information Exchange Bulleting, Vol. I, No. 3, June 82. It is a very concise description of the purpose of and what should be gained from the weekly schedule meeting.

C. Recommendations. The importance of the weekly schedule meeting and the weekly schedule should be reemphasized. The meeting format should follow that described in Exhibit III-12. The Director or Deputy Director should be directly involved in the weekly schedule process. Authority to make schedule changes should be limited to the Director, Deputy Director, and the Chief ERMD. Variance Analysis should be performed. The scheduling process conducted by the Schweinfurt DEH is one of the best we have seen. The schedules are closely followed with a minimum of deviation. Exhibit III-13, page III-39, is an excerpt of the portion of Standing Operating Procedure for the ERMD concerning Schweinfurt's scheduling procedures.

### 3.4 Annual Work Plan

A. Finding. The FY85 Annual Work Plan was being developed during the course of this study. A review of this plan was made in conjunction with the procedures provided in DA PAM 420-6 and the guidance provided by V Corps letter AETV-EHM-IE of 9 April 1984, Subject: Fiscal Year 85 Annual Work Plan.

A review of the FY84 plan and its use and update during the year was also made.

The FY84 plan has not been updated or used as a source document for planning and executing the current year workload execution.

With the exception of a formal Facilities Component Inspection Program the Annual Work Plan is prepared in accordance with the latest DA and V Corps guidance. Due to staffing constraints there is no planned Facilities Component Inspection Program. As a result the accuracy of this Unconstrained Requirements Report (URR) is questionable. The data contained in the URR is developed from information provided by the Chief, Buildings and Grounds Division and the Chief, Utilities Division. This data is developed by the Division Chiefs based on random unscheduled, unplanned inspections of facilities. There is no formal written inspection report prepared.

B. Conclusion. The FY85 AWP was prepared in accordance with DA PAM 420-6 and the guidance provided by Headquarters V Corps. With the exception of the various projects listings provided with the AWP, virtually every activity HAMM ASSOCIATES has reviewed does not use the AWP as a work management document after it has been submitted and approved. There are many reasons given as to why they do not use the plan.

The following is a quotation from the Scope of Work from the U.S. Army Engineer Division, Huntsville, Alabama, Request for Quotation DACA87-84-Q-0140 dated 10 August 1984, Revision of the Annual Work Plan which sums up all the reasons we have heard.

"2.4 As a financial tool, the current AWP format is acceptable. However, as a management tool, the AWP format has its shortfalls. The preponderance of numbers tends to cloud the relative importance of

requirement and the capability of specific resources; the lack of reflection of any historical experience leaves a gap in the ability to use the AWP as an effective tool for adjusting resources; and the segregation of information by fiscal appropriation makes it difficult to relate the impact of specific requirements on the total requirement to be accomplished by the engineers. These and other shortfalls necessitate revision to the AWP formats and associated descriptive preparation and use guidance."

Given the current staffing level in the P&E Section a formal Component Inspection Program cannot be developed without a sacrifice in some other area. The number of required inspectors should be determined based on DA PAM 570-551, Staffing Guide for U.S. Army Garrisons, page 2-331.

C. Recommendations. No changes in the procedures used to develop the AWP are recommended at this time. Until the AWP is more closely aligned with the budget process the communities will continue to resist using it as a management tool. The DEH should be provided adequate resources in order to accomplish the Component Inspection Program in accordance with the Office of the Chief of Engineers Letter DAEN-MPO-M of 23 July 1982, Subject: Revised Facilities Component Inspection Policy. Until this is done Baumholder will not have an accurate identification of its maintenance and repair deficiencies.

### 3.5 Self-Help

A. Finding. The Baumholder Community has a Self-Help Program.

The program includes self-help instruction to new occupants of family housing and troop billeting and a Self-Help Issue Point (SHIP) for issuance of materials.

Self-Help Instruction. A self-help class was observed during the on-site visit. The following subjects were addressed:

Energy Conservation	-	14 minutes
Environmental Matters	-	9 minutes
Fire Safety	-	26 minutes
Self-Help Matters	-	36 minutes

The self-help segment of the instruction was oriented mainly towards how to obtain DEH assistance in maintenance matters. Relatively little time was expended dealing with occupant self-help responsibilities; only three or four specific examples of occupant responsibility were presented. Attendance records are maintained and cards prepared authorizing issue of self-help materials. There is no roster of new occupants assigned provided to the self-help section by Family Housing.

Self-Help Issue Point (SHIP). A SHIP is colocated with the DEH supply warehouse and is open during normal working hours. Issues, in both quantity and dollar value, have declined from two years ago as shown by logs maintained in the SHIP.

#### FAMILY HOUSING ISSUES

<u>Month</u>	1983/1984		1981/1982	
	<u>No. of Issues</u>	<u>Value</u>	<u>No. of Issues</u>	<u>Value</u>
November	71	\$ 213.95	123	\$ 841.19
December	60	221.90	116	746.93
January	58	224.33	92	528.71
February	45	250.22	83	516.05
March	60	197.14	87	430.03
April	44	112.17	101	757.30
May	68	267.74	102	530.28
June	49	150.45	95	566.37
TOTAL	455	\$1,637.90	799	\$4,916.86
% Decrease	43.1	66.7		

TROOP ISSUES

<u>Month</u>		<u>1983</u>		<u>1981</u>	
	<u>No. of Issues</u>	<u>Value</u>		<u>No. of Issues</u>	<u>Value</u>
November	39	\$571.17		30	\$ 717.90
December	32	354.50		54	950.41
<b>TOTAL</b>	<b>71</b>	<b>\$925.67</b>		<b>84</b>	<b>\$1,668.31</b>
<b>% Decrease</b>		<b>15.5</b>		<b>44.5</b>	

The SHIP has a stockage listing of 124 items (this information was not provided at the self-help class; although a board with self-help items is located in the classroom, it was not used because it was out of date). An inventory of the SHIP revealed 114 bins with bin cards, with 11 items (approximately 10 percent) at zero balance. A bin check for restocking purposes is made quarterly. No "want list" is maintained. The SHIP is open for operations during normal working hours and is frequently unmanned due to other responsibilities of the self-help NCO. As the SHIP is colocated with the DEH supply warehouse, supply personnel back up the self-help NCO and will issue materials to customers; however, during these times there is no technical assistance available. There are no aids/models for demonstrating maintenance/repair procedures at the SHIP nor are tools available for issue.

Self-Help PM Interface. Although a precise count of self-help type tasks accomplished by the Preventive Maintenance Shop was not obtained, a limited review of daily PM team work summaries and observations made during work sampling revealed that self-help tasks were in fact being accomplished by the PM shop. Changing light bulbs, replacing drain stopper and chain and minor plumbing tasks were reported.

B. Conclusion. The self-help program could be made more effective through command emphasis and procedural changes.

The program can be made more effective through command emphasis of occupant self-help responsibilities, revised procedural changes to ensure compliance and program revisions to provide greater customer accessibility and assistance.

A more effective self-help program will result in an increase in occupant accomplishment of normal household tasks that any prudent homeowner would reasonably be expected to perform, and a decrease in self-help (low skill) tasks performed by the PM shop.

C. Recommendations

- Family Housing should provide a letter to the incoming occupant directing the occupant to attend a specific self-help class (copy to self-help). Nonattendance should be followed up through command channels.
- Institute a similar procedure for troop units.
- Include in the self-help instruction a listing of self-help tasks and lists of materials and tools available for issue. Expand instruction to include demonstration of procedures to accomplish high frequency tasks. Emphasize occupant/troop responsibilities.
- Coordinate the self-help program with work reception. If the trouble is a self-help task, the customer should be informed to report to the SHIP for assistance.
- Staff the SHIP with a maintenance mechanic (English speaking). Develop training aids (in the SHIP) to demonstrate specific maintenance/repair procedures for the customers. This same worker would provide the applicable portions of self-help instruction.
- Change the SHIP operating hours to include operation outside of normal working hours, e.g., substitute a Saturday for Monday.
- Reinstate issuance of tools. Enforce return through the Family Housing Office or unit commanders, as appropriate.
- Inventory and restock self-help materials on a weekly basis. This would also be a responsibility of the SHIP-assigned maintenance mechanic.

- Develop a want list in accordance with USAREUR Reg 420-1 and review periodically for candidate items to be added to the SHIP authorized stockage list.

### 3.6 SO Work Management

A. Finding. Management of SO work is accomplished at two levels -- ERMD and shop.

SO management by ERMD (Work Control) includes receipt of customer requests, determination of DEH responsibility, prioritization and assignment to shop, and (Scheduling) weekly allocation of shop hours for SO work. The shops schedule actual accomplishment of the work. (Shop Management of SO work is discussed in Section V, page V-1.)

Analysis of data from several sources reveals that SO backlog in the shops is significantly smaller than Work Control data shows. This results in scheduling excessive SO hours to the shops, which, in turn, causes inefficiencies in shop accomplishment. Data to support these findings is as follows:

(1) Data from the Unit Backlog and Work Force Distribution Reports reveals that the daily IJO/SO experience for the shops analyzed averaged 1,244 hours (see Exhibit III-14, page III-40). The average distribution of these hours for the previous four quarters was 40.8 percent (507/1,244) performing SO work and 59.2 percent (737/1,244) performing IJO work.

(2) Interviews, observations and data analysis revealed that there is a general operating philosophy in work control that SOs should be accomplished on a "priority" basis. This philosophy carries over to the shops where foremen are assigning relatively few SOs to work crews with crews returning to shops during the day for additional work. This finding is substantiated by data from V Corps Work Force Utilization and

Backlog Management Report (RCS AETVDEH-4) dated 26 Jul 84 which shows few (667) SOs backlogged relative to the V Corps tolerance level (1,594 including Shop 10) and by the Baumholder quarterly Unit Backlog and Work Force Distribution Report (RCS AETVDEH-4) for the period ending 30 Jun 84, showing 7 of 13 shops with an SO backlog of 5 or less days.

(3) These figures, in fact, may be overstated. (Exhibit III-15, page III-41, shows a comparison of backlogged SO counts from several data sources.) An actual count of in-shop SOs was conducted in several shops (Electric 02, Metal 04 and R/AC & Kitchen Equipment 06) where the work sampling team reported indications of overmanning and/or insufficient work to keep craftspersons fully productive (slow work pace and/or frequent return to shop for more work). A comparison of two data sources is shown below (See Exhibit III-15, page III-41 and Exhibit III-16, page III-42 for details):

<u>Data Source</u>	<u>Electric (02)</u>	<u>Metal (04)</u>	<u>R/AC&amp;KE (06)</u>	<u>Total</u>
	<u>No. Manhours</u>	<u>No. Manhours</u>	<u>No. Manhours</u>	<u>No. Manhours</u>
Qtrly Unit Backlog & Work- Force Dist Rpt for 30 Jun 84	51	122	81	352
Actual Shop Count	15	36	13	56
Shop Count: (Report Count (%)	29.4	29.5	16.0	15.9
				63.2
				63.3
				26.5
				27.6

This count revealed that the actual "SOs in shop personhours" was only 28 percent (161/583) of that recorded on the most recent Unit Backlog and Work Force Distribution Report. Average daily experience (3rd Qtr., FY 84) shows an average of 182 hours/day being expended on SO work in these three shops. The in shop count however shows only 161 manhours

backlogged. Exhibit III-16 calculations show that SO shop-days backlogged in these shops based on the actual in-shop SO count is less than four days, vice the eight indicated by the report. This situation must, inevitably, lead to overmanning of SO crews.

(4) Observations made during work sampling also revealed overmanning of SO teams and frequent return trips to shops for material and additional work. Work sampling showed significant variance by type of work document in categories 230 (travel), 240 (planning) and 340 (idle - not controlled by DEH) as shown below.

<u>Category</u>	<u>Percent of Work Day</u>		
	<u>SO</u>	<u>IJO</u>	<u>Monthly IJO</u>
230	20.6	9.9	16.8
240	4.4	2.4	2.3
340	2.0	.4	1.3
TOTAL	27.0	12.7	20.4
Equivalent time for 8 hour day	2h 10m	1h 1m	1h 38m

The impact of time expended in the above categories for SO work is reflected in a comparison of work sampling results when calculated by type of work document as shown below.

<u>Category</u>	<u>SO%/Hours</u>	<u>IJO%/Hours</u>	<u>Monthly IJO%/Hours</u>
100 (Prod)	48.1%/3h 51m	59.0%/4h 43m	55.2%/4h 25m
200 (Ind Prod)	43.8%/3h 30m	33.5%/2h 41m	33.1%/2h 39m
300 (Non-Prod)	8.1%/0h 39m	7.5%/0h 36m	11.7%/0h 56m

SO work by its methods of accomplishment, is inherently less productive than other type work. However over manning of SO crews compounds the inefficiencies. For example, while category 340 is beyond the worker's ability to control and categories 230 and 240 may be necessary, the amount of time expended in these categories is roughly

doubled or trebled when 2 or 3 workers are assigned to accomplish a single SO or a series of SOs sequentially.

(5) DEH completion standards for SOs were provided by MESB and are as follows:

<u>Priority</u>	<u>Days to Complete</u>
1	0-3
2	4-7
3	8-14

SO priorities are assigned by the work reception clerk. HAMM ASSOCIATES was advised that work reception is under pressure from customers to give their request high(er) priorities than may have been justified. More than one supervisor confirmed this. (One SO in AC&R/Kitchen Equipment Shop had a priority 2 assigned to an SO for a space heater repair -- in July.)

(6) Customer Identification Codes are not being entered on the SOs, DD 4287.

B. Conclusion. A reduction in SO hours scheduled to the shops and adherence to the one-man SO team concept will result in more efficient accomplishment of SOs.

Analysis of SO work in shops analyzed (Electric 02, Metal 04, and R/AC/KE 06) indicates that too many workers are chasing too few SOs. Accomplishment of SOs as they are received, although it may result in higher customer satisfaction, is not efficient. This in conjunction with insufficient vehicles (requires shop loading of SO teams) and unrealistic assignment of priorities, precludes any planning at the shop level to more efficiently accomplish this work.

The SO backlog should be allowed to increase (V Corps tolerance

levels would be maintained) by reducing scheduled SO hours. This will facilitate shop assignment of sufficient workloads for SO teams and allow more efficient in-shop planning (e.g., grouping SOs by geographic area). Initially shop SO hours should be reduced by approximately 35 percent. Exhibit III-17, page III-43, provides the recommended workforce distribution for SO and IJO work for the shops analyzed. A daily average of 180 SO hours would be shifted to IJO work. Assuming 248 work days a year, this would result in 44,640 additional IJO hours per annum. This increased work accomplishment equates to \$530,690 per annum. (See Exhibit III-19, page III-45.) Additional vehicle costs (Exhibit V-5, page V-14) total \$53,621 per annum. Net cost avoidance of additional work is \$477,069 (\$530,690 - \$53,621) per annum.

To realize the full productive potential of these shops, the DEH should adhere to the general principle of single-worker SO teams. If the recommendations for revisions in procedures for accomplishing PM shop work (Section V, page V-3), enhancing the self-help program (Section III, page III-9) and reducing the scheduled shop SO hours, as discussed herein, are adopted, the result will be a more efficient workforce.

Reducing scheduled SO hours will allow the shop backlog to increase (while still remaining within the V Corps tolerance level). Assigning an increased number of SOs to fewer workers (in conjunction with improved craftsman planning of tools and material requirements) will result in reduced travel time. This will also have the effect of significantly decreasing the average manhours per SO. (MESB should validate this on a quarterly basis.)

Work Reception should be using the Customer Identification Code on all SOs (DA 4287). The use of this code will serve several purposes.

- Assist in tracking reimbursable costs.
- Analyzing where the workload is originating for the purposes of determining where problem areas are.
- Have the SO accounting system in place and operating properly when IFS is installed.

C. Recommendations

- Determine the true number of SOs in shop for accomplishment.
- Schedule a reduced number of SO hours (approximately 35 percent reduction) to increase the shop SO backlog to a number that will allow a full day's workload to be assigned to each craftsman working on SOs. When equilibrium has been achieved, make further adjustments based on the quarterly backlog report.
- Ensure shop supervisors adhere to the reduced scheduled SO hours.
- Implement single-worker SO teams. Assigning more than one worker to an SO team should be made only by exception when the foreman validates the requirement.
- Require the Work Control Chief or his assistant validate all assigned priorities 1 and 2.
- Deemphasize the urgency of accomplishing SOs as a primary shop procedure. Use the validated priorities and SO completion standards as the goal.
- Reallocate excess SO hours for accomplishment of backlogged IJOS.
- Determine shop vehicle requirements to implement the above recommendations (see Section V, page V-7).

Use the Requestor Identification Number on the SOs, DD 4287.

3.7 PM Shop Task Codes

A. Finding. Task codes have been developed for all shops except the PM shop.

B. Conclusion. Under the present system there is no way to determine what tasks the PM Shop is performing nor a standard against which to measure the shop's performance. Task Codes will also be

required for all shops when IFS is operational. The best sources for developing PM Shop task codes are the TB 420-30, Service Handbook and TB 420-34 Preventive/Recurring Maintenance Handbook. Suggested task codes for another DEH are contained in Exhibit III-20, page III-46.

C. Recommendation. Establish a task code listing using engineered performance standards and standard numbers for the PM Shop.

### 3.8 Management Information

A. Finding. Management information of various types is available.

Much of this information is compiled to support reporting requirements of V Corps which compiles the individual military community reports into Corps management reports and disseminates them back to the communities. The cycle for many of these reports is on a quarterly basis; however the communities compile input data on a weekly and monthly basis. Some Corps management reports, such as the Work Force Utilization and Backlog Management Report (RCS AETVDEH-4) provide data from the preceding report for comparison.

B. Conclusion. Management information should be provided to the DEH management personnel on a formal, scheduled basis.

DEH management should have information that will illustrate trends over a period of time. This information should be presented monthly (by MESB) to assist DEH managers in gauging the efficiency and effectiveness of the organization. Presentation should, at a minimum, include all information used by external DEH organizations to develop performance indicators. Several examples of data graphs which would be useful to management are shown in Exhibit III-21, page III-52. For example, if recommendations made in this study concerning SO work

management are adopted, there should be a significant and noticeable decrease in person-hours expended per SO. (See Exhibit III-21, page III-54, Average Person-Hours Per Service Order).

C. Recommendation. That a formal briefing of management information be presented to DEH management personnel on a monthly basis.

Adoption of this recommendation will facilitate identification of variances and unfavorable trends, analysis and determination of their cause, and timely management decisions to enhance the efficiency and effectiveness of the DEH.

## EXHIBIT III-1

SICK LEAVE ANALYSIS<sup>1</sup>

<u>SHOP</u>	<u>A TOTAL PAID MANHRS<sup>2</sup></u>	<u>B SICK LEAVE<sup>3</sup></u>	<u>C SICK LEAVE GOAL<sup>4</sup></u>	<u>D EXCESS SICK LEAVE<sup>5</sup></u>	<u>E SHOP RATE<sup>6</sup></u>	<u>F EXCESS SICK LV COST<sup>7</sup></u>
<u>SUB-FE Maintenance Activities</u>						
NEUBRUECKE	53,656	3,944	2,683	1,261	\$8.51	\$ 10,731
IDAR OBERSTEIN	40,808	2,744	2,040	704	8.30	5,843
EIFEL	18,792	616	940		8.28	
NAHBOLLENBACH	25,488	3,056	1,274	1,782	9.05	16,127
<u>Subtotal</u>	<u>138,744</u>	<u>10,360</u>	<u>6,937</u>	<u>3,747</u>		<u>\$ 32,711</u>
% of Col. A		7.47	5.00			
Avg. Annual Hrs/Wkr		155.3	104.0			
<u>Buildings &amp; Grounds Division Shops</u>						
01 Carpentry	34,976	3,375	1,749	1,626	\$9.44	\$ 15,349
04 Sheetmetal	37,416	2,472	1,871	601	9.37	5,631
05 Paint	28,008	3,632	1,400	2,232	9.64	21,516
07 Roads	67,630	7,328	3,382	3,946	9.40	37,092
08 Grounds	123,600	10,888	6,180	4,708	7.41	34,886
10 PM	73,176	5,432	3,659	1,773	9.10	16,134
15 Railroads	4,000	1,072	200	872	9.06	7,900
16 Masonry	41,312	2,888	2,066	822	9.36	7,694
17 Roofing	12,379	1,112	619	493	8.70	4,289
21 Entomology	14,552	648	728		8.82	
<u>Subtotal</u>	<u>437,049</u>	<u>38,847</u>	<u>21,852</u>	<u>17,073</u>		<u>\$150,491</u>
% of Col. A		8.89	5.00			
Avg. Annual Hrs/Wkr		184.9	104.0			

<sup>1</sup> Data from monthly Performance and Productivity Control System Reports, CA4-EGK for months Jul 83 through Jun 84.

<sup>2</sup> Ibid. Column Tot H (Total Hours).

<sup>3</sup> Ibid. Code L2 plus Code L7.

<sup>4</sup> Goal is 5 percent of Column A.

<sup>5</sup> Column B minus Column C.

<sup>6</sup> Data from DEH Elephant III Organization Chart - Hourly Rates FY84.

<sup>7</sup> Column D times Column E.

## EXHIBIT III-1 (continued)

<u>SHOP</u>	<u>A TOTAL PAID MANHRS<sup>2</sup></u>	<u>B SICK LEAVE<sup>3</sup></u>	<u>C SICK LEAVE<sup>4</sup></u>	<u>D EXCESS SICK LEAVE<sup>5</sup></u>	<u>E SHOP RATE<sup>6</sup></u>	<u>F EXCESS SICK LV COST<sup>7</sup></u>
<u>Utilities Division Shops (Less Plant Operations)</u>						
02 Electric	55,664	5,280	2,783	2,497	9.28	23,172
03 Plumbing	20,880	1,126	1,044	82	\$10.09	\$ 827
06 Ref/AC/KE	35,584	1,280	1,779		9.51	
13 Water Sys	20,536	872	1,027		12.54	
14 Sewage Sys	21,048	864	1,052		9.20	
19 Steamftg.	65,735	4,568	3,287	1,281	9.26	11,862
22 Fuel Stor.	10,968	608	548	60	9.61	577
23 Refuse Col	34,661	3,487	1,733	1,754	7.75	13,594
Subtotal	265,076	18,085	13,253	5,674		\$50,032
% of Col. A		6.82	5.00			
Avg. Annual Hrs/Wkr		141.9	104.0			
<u>Plant Operations</u>						
30 Boiler	73,664	2,048	3,683		\$8.45	
31 Water	36,888	416	1,844		8.53	
32 Sewage	18,400	600	920		7.64	
34 Refrig.	9,408	384	470		7.38	
35 Pres. Heat	114,840	4,400	5,742		7.26	
Subtotal	253,200	7,848	12,659			
% of Col. A		3.10	5.00			
Avg. Annual Hrs/Wkr		64.5	104.0			
SHOP TOTAL	1,094,069	75,140	54,701	26,821 <sup>8</sup>		\$233,224
% of Col. A		6.87	5.00			
Avg. Annual Hrs/Wkr		142.9	104.0			

<sup>8</sup> This figure is calculated by totaling only excess sick leave and does not take into account the offset by shops which are under the 5 percent sick leave goal.

**EXHIBIT III-1 (continued)**

<u>SHOP</u>	A <u>TOTAL PAID MANHRS<sup>2</sup></u>	B <u>SICK LEAVE<sup>3</sup></u>	C <u>SICK LEAVE<sup>4</sup></u>	D <u>EXCESS SICK LEAVE<sup>5</sup></u>	E <u>SHOP RATE<sup>6</sup></u>	F <u>EXCESS SICK LV COST<sup>7</sup></u>
<u>Overhead Shops</u>						
E *DEH	4,176	0	209			
EO Operations	9,280	112	464			
EE *En/Environ	4,122	120	206			
EA *Admin	9,024	1,838	451	1,387	\$11.09	\$ 15,382
ER ERMD	4,344	40	217			
ERSY MESB	7,744	371	387			
ERBP Prog & Bud	11,936	856	597	259	11.32	2,932
EREF Est.	12,360	1,331	618	713	12.36	8,813
ERWR Work Recep.	18,352	1,071	918	153	8.55	1,308
EP **EPSD	3,648	218	182	36	13.20	475
EPES **Eng Svc	52,832	1,784	2,642			
EPCI Cont Insp	33,408	614	1,670			
EPMP **Mast Plng	11,368	383	568			
EPRP Real Prop	8,168	456	408	48	10.25	492
EPSS Sup & Stor	27,897	1,488	1,395	93	10.10	939
ESEQ Equip & Mnt	43,694	2,512	2,185	327	9.54	3,120
EFFB *Fire Prot	92,002	1,920	4,600			
EB B&G	7,312	144	366			
EBBS B&S	2,088	0	104			
EBLM Land Mgmt	2,088	32	104			
EBRR Rds & RR	2,256	40	113			
EU *Utilities	8,544	192	427			
EUME Mech	2,960	328	148	180	8.85	1,593
EUEL *Elec	3,624	24	181			
EUSN Sanitation	2,088	40	104			
Subtotal	385,315	15,974	19,266	3,108		\$ 35,054
% of Col. A		4.13	5.00			
Avg Annual Hrs/Wkr		85.9	104.0			
GRAND TOTAL	1,479,384	91,054	73,967	29,929		\$268,278
% of Col. A.		6.15	5.00			
Avg. Annual Hrs/Wkr		128.0	104.0			

\*Less than 12 months data available from reports.  
\*\* Does not include Maternity Leave - Column L3.

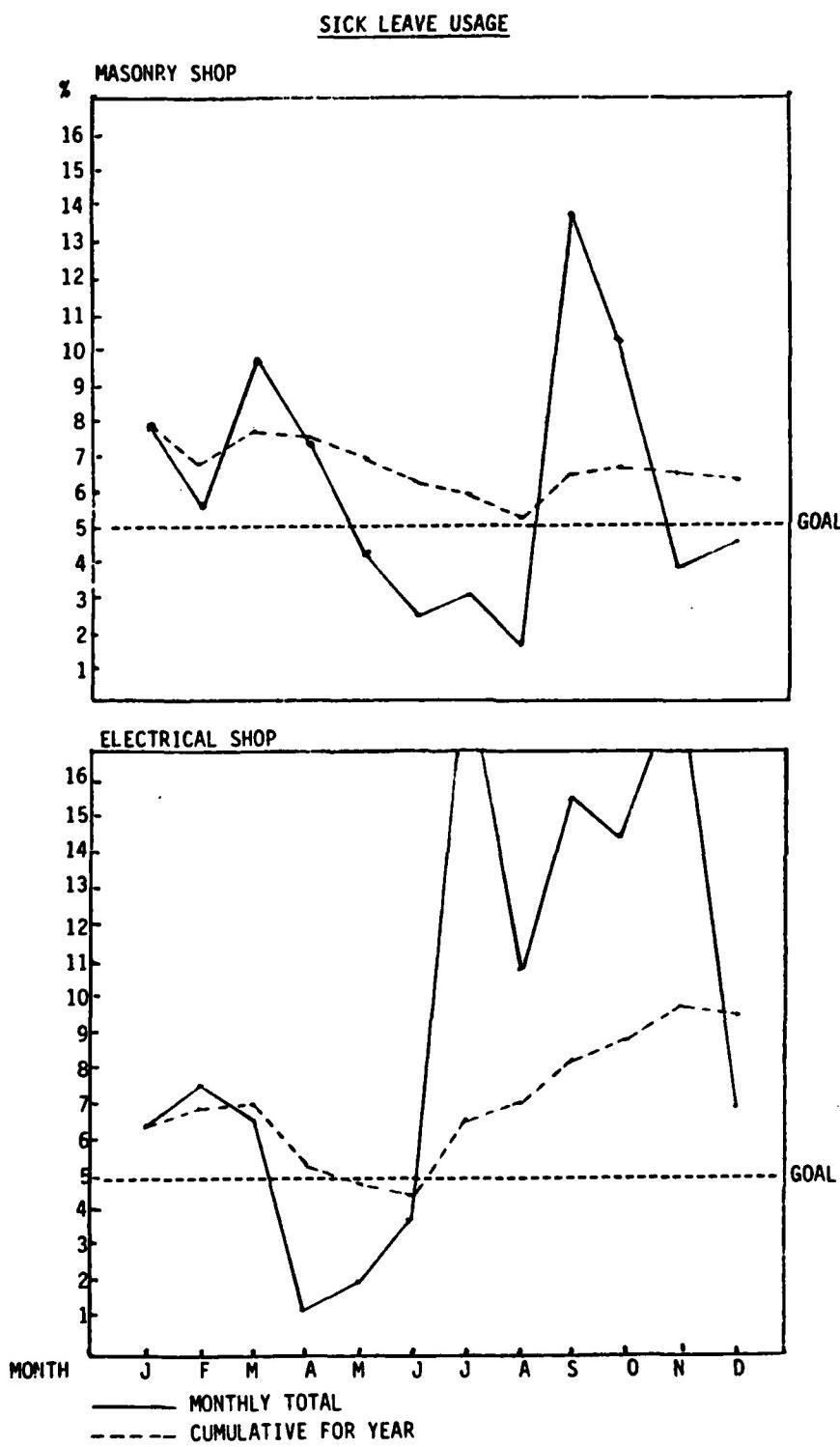
## EXHIBIT III-2

RANKING OF SHOPS BY SICK LEAVE USAGE<sup>1</sup>

<u>B&amp;G and Utilities Div. Shops</u>	<u>% Sick Leave Usage</u>	<u>Overhead Organizations</u>	<u>% Sick Leave Usage</u>
<u>Shop</u>		<u>Shop</u>	
15 Railroads	26.80	Admin Ofc	20.37
05 Paint	12.97	Mech Br Ofc	11.08
NAHBOLLENBACH	11.99	Est Br	10.77
07 Roads	10.84	Prog & Bud Br	7.17
23 Refuse Collection	10.06	EP&SD Ofc	5.98
01 Carpentry	9.65	Wk Recep Br	5.84
02 Electric	9.49	Equip & Maint Br	5.75
17 Roofing	8.98	Real Prop Br	5.58
08 Grounds	8.81	Sup & Stor Br	5.33
NEUBRUECKE	7.35	MESB	4.79
10 Preventive Maint.	7.42	Eng Svcs & Admin	3.38
16 Masonry	6.99	Master Plng Br	3.37
19 Steamfitting	6.95	En/Environs Ofc	2.91
IDAR OBERSTEIN	6.72	Utilities Div Ofc	2.25
04 Sheetmetal	6.61	Fire Prot Div	2.09
22 Fuel Storage	5.54	B&G Div Ofc	1.97
03 Plumbing	5.39	San Br Ofc	1.92
21 Entomology	4.45	Cont Insp Br	1.84
13 Water Systems	4.25	Rds & RR Br Ofc	1.77
14 Sewage Systems	4.10	Land Mgt Ofc	1.53
34 Cold Storage	4.08	Opsn Ofc	1.21
35 L Pressure Heat	3.83	ERMD Ofc	0.92
06 Refer/AC/Kitchen	3.60	Elec Br Ofc	0.66
EIFEL	3.28	B&S Br Ofc	0.00
32 Sewage	3.26	DEH Ofc	0.00
30 Boiler	2.78		
31 Water	1.13		

<sup>1</sup> Data from Exhibit III-1.

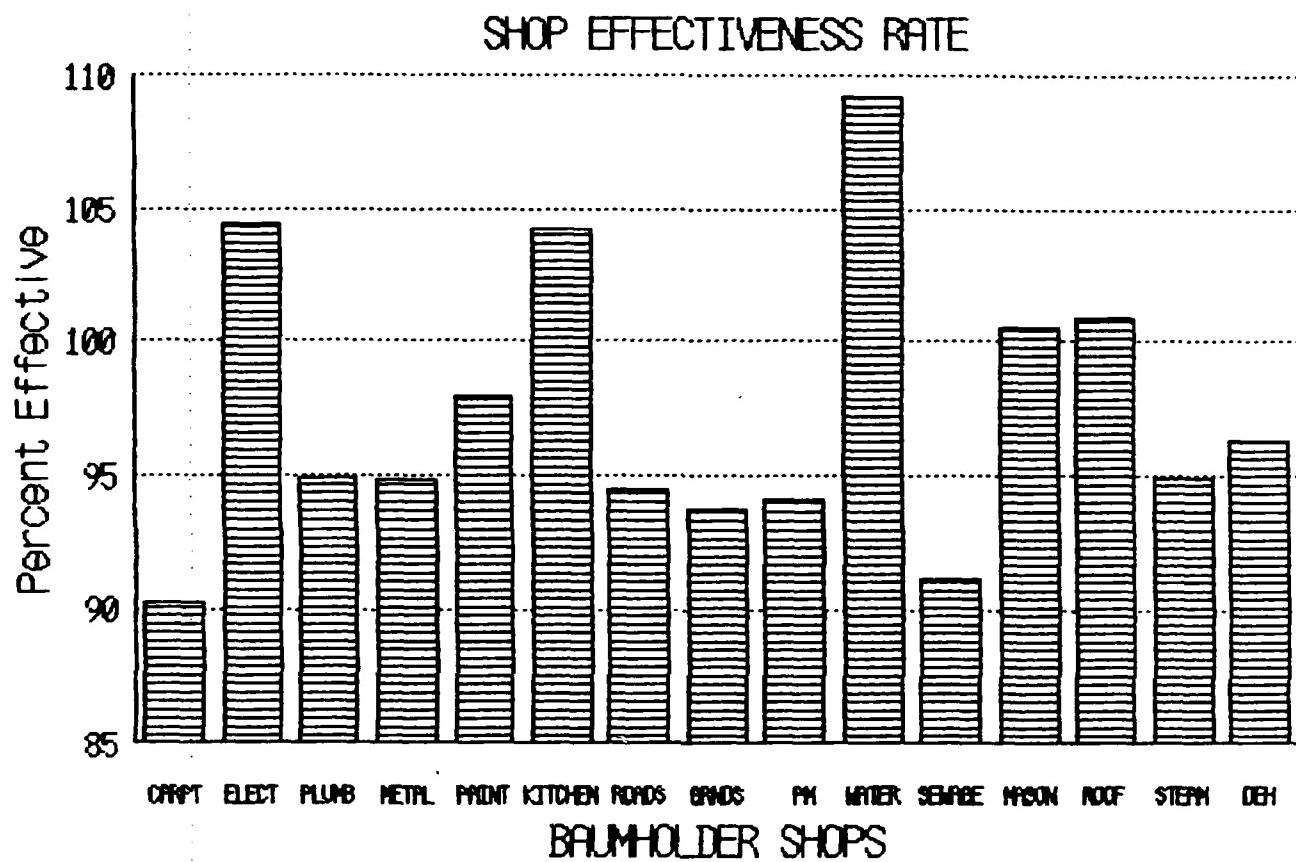
EXHIBIT III-3

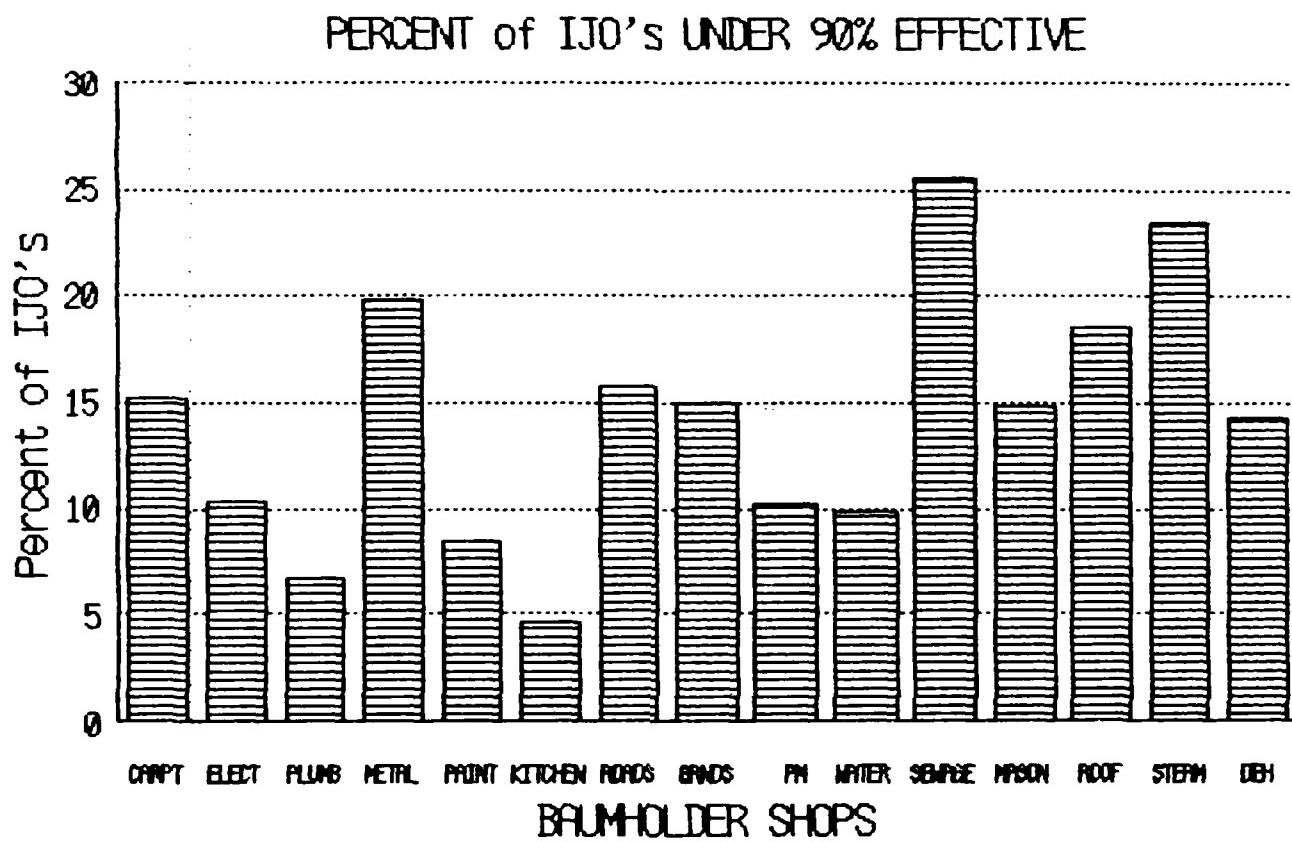


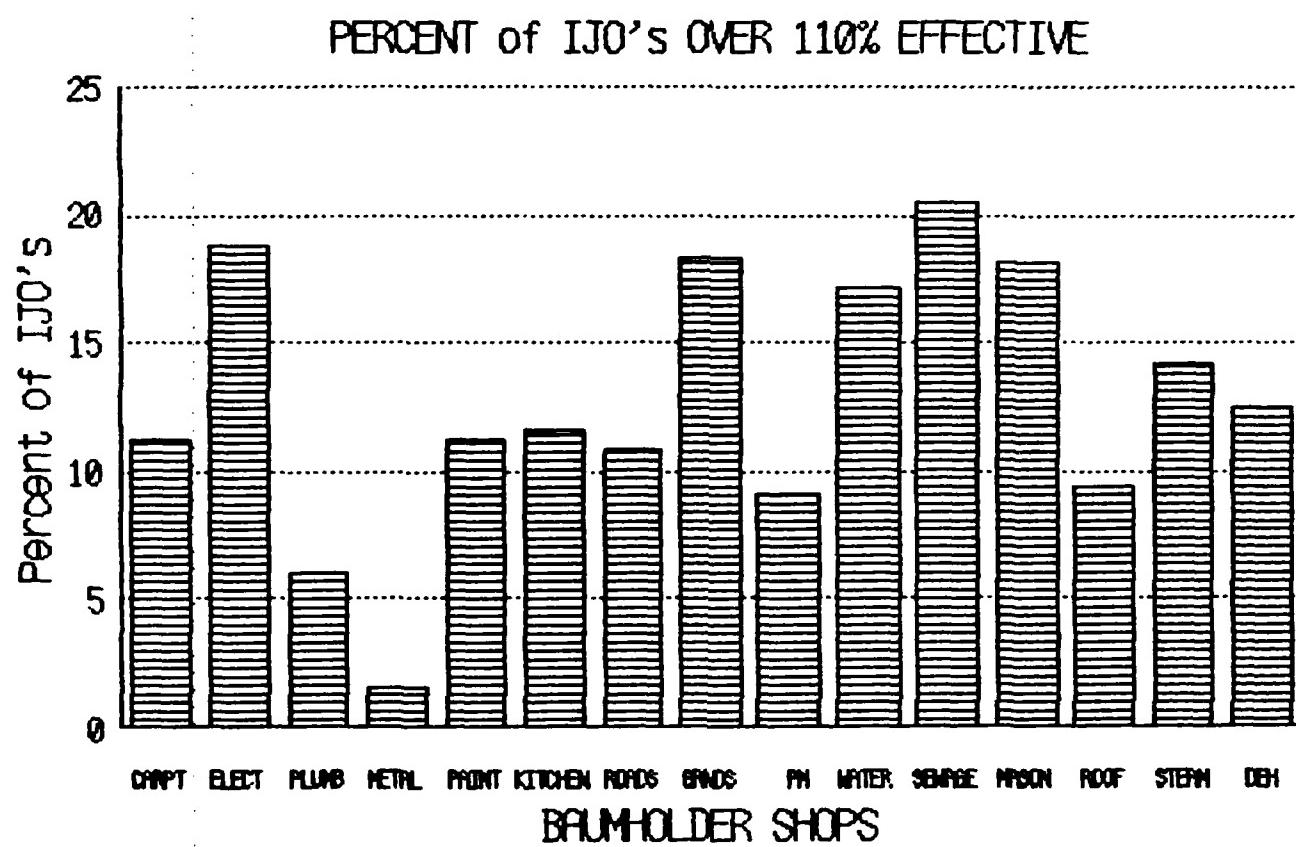
**EXHIBIT III-4**

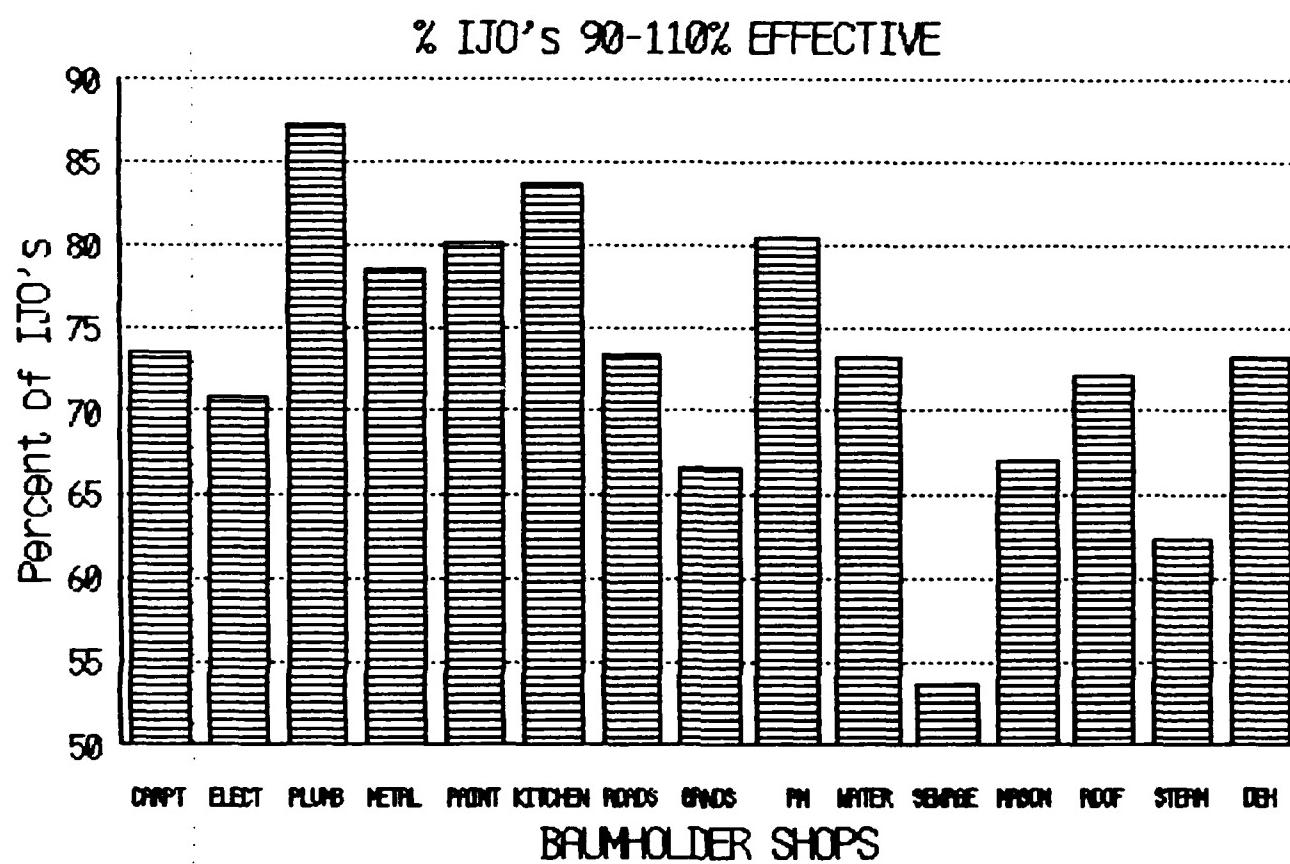
## COMPLETED IJO'S PERFORMANCE SUMMARY

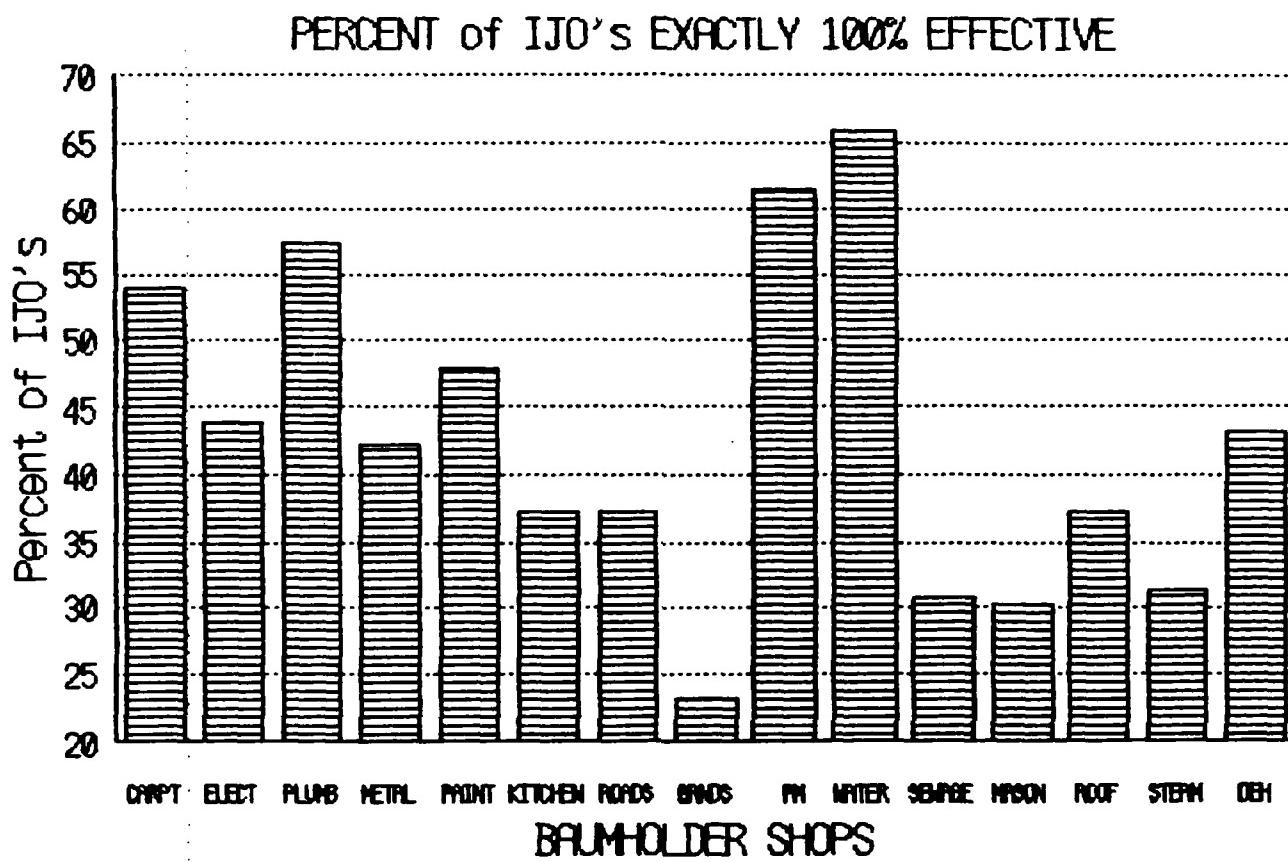
I FY 84 through 23 July 1984











## EXHIBIT III-10

## IJO SCHEDULING

Week Ending 31 August 84

<u>Shop</u>	<u>Hours Avail for IJO</u>	<u>Hours Sched IJO</u>	<u>Total Hours Worked IJOS</u>	<u>Hours Worked As Orig. Scheduled</u>
01 Carpentry	240	320 <sup>1</sup>	241	125
02 Electric	360	137	336	24
03 Plumbing	59.8	59.2	32.2	3.2
04 Metal	358	358	358	291
05 Paint	310	310	262	232
06 Refer	152	152	121	56
07 Roads	244	424 <sup>2</sup>	328 <sup>3</sup>	40
08 Grounds	240	240	215. <sup>14</sup>	0
13 Water	0	0	32	0
14 Sewage	0	0	84	0
16 Masonry	389	389	324	202
17 Roofing	48	48	74	12
19 Steamfitters	688.9	688.3	583.7	316.1
SUBTOTAL	3089.7	3125.5	2917.0	1301.3

% Hours Worked as Originally Scheduled: Col. 4/Col. 2 = 41.6%

<sup>1</sup> DL-002-4 80 hours added after sched determined but not worked due to nonavailability of materials.

<sup>2</sup> GJ-074-4 200 hours added after sched. determined but not worked  
DL-832-3 40 hours added after sched. determined 286 hours worked this week on this IJO.

<sup>3</sup> 513.2 hours reported as worked on IJO but only 328 can be identified.

<sup>4</sup> 171 hours for reforger - unscheduled.

## EXHIBIT III-10 (continued)

## IJO SCHEDULING

Week Ending 25 May 84

<u>Shop</u>	<u>Hours Avail for IJO</u>	<u>Hours Sched IJO</u>	<u>Total Hours Worked IJOs</u>	<u>Hours Worked As Orig. Scheduled</u>
01 Carpentry	356	323	246.2	139.2
02 Electric	332	352	382	208
03 Plumbing	166.5	166.2	124	79.6
04 Metal	406	406	264.2	128.2
05 Paint	373	371	355 <sup>5</sup>	285
06 Refer	23 <sup>6</sup>	92	52	28
07 Roads	714 <sup>7</sup>	714	595.5	527
08 Grounds	324	324	329.5	276.2
13 Water	0	0	24	0
14 Sewage	0	0	32	0
15 Masonry	421	421	449	197
16 Roofing	120	120	81	80
19 Steamfitters	804	806	691	460.6
SUBTOTAL	4039.5	4095.2	3625.4	2408.8

% Hours Worked as Originally Scheduled: Col. 4/Col. 2 = 58.8%

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5 Schedule shows 405 hours worked on IJOs.

6 No hours set aside for S0s - 309 used.

7 Only 2 hours set aside for S0s - 53 hours used; 232 hours scheduled for IJOs - 370.2 hours used.

## EXHIBIT III-10 (continued)

## I JO SCHEDULING

Week Ending 30 March 84

<u>Shop</u>	<u>Hours Avail for I JO</u>	<u>Hours Sched I JO</u>	<u>Total Hours Worked I JOs</u>	<u>Hours Worked As Orig. Scheduled</u>
01 Carpentry	378	378	322	226
02 Electric	428 <sup>8</sup>	392	372	144
03 Plumbing	150.8	150.2	141.6	114.6
04 Metal	398	398	210 <sup>9</sup>	110
05 Paint	384	384	311	262
06 Refer	120	120	52	48
07 Roads	197	197	248.3 <sup>10</sup>	92
08 Grounds	466	466	486.5	216.2
13 Water	14	14	28	14
14 Sewage	72	72	22	0
16 Masonry	504	504	303	442
17 Roofing	152	152	126.2	84.2
19 Steamfitters	614	614	666	398.5
<b>SUBTOTAL</b>	<b>3875.8</b>	<b>3841.2</b>	<b>3288.6</b>	<b>2151.5</b>

% Hours Worked as Originally Scheduled: Col. 4/Col. 2 = 56.0%

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<sup>8</sup> Schedule shows 392 hours available.<sup>9</sup> 194 hours sched. for S0s - 355 hours used.<sup>10</sup> 856 hours sched. for IJOs - 544.3 hours used.

## EXHIBIT III-10 (continued)

## IJO SCHEDULING

Week Ending 13 Jan 84

<u>Shop</u>	<u>Hours Avail for IJO</u>	<u>Hours Sched IJO</u>	<u>Total Hours Worked IJOs</u>	<u>Hours Worked As Orig. Scheduled</u>
01 Carpentry	356	332	413	258
02 Electric	224	210	336	128
03 Plumbing	3.8	3.2	91.2	3.2
04 Metal	206	126	266	118
05 Paint	314	308	353	213
06 Refer	80	80	202.4 <sup>11</sup>	64.2
07 Roads	320	320	455.3	175.8
08 Grounds	496	496	508	331.2
13 Water	0	0	72	0
14 Sewage	0	0	8	0
16 Masonry	600	600	621.2	447
17 Roofing	80	80	82.2	56
19 Steamfitters	464	330.2	293.1 <sup>12</sup>	56.3
SUBTOTAL	3143.8	2885.4	3701.4	1850.7

% Hours Worked as Originally Scheduled: Col. 4/Col. 2 = 64.1%

<sup>11</sup> 400 hours scheduled for S0s and IJ0s - 288 hours used.<sup>12</sup> 466.2 hours sched. for S0s - 584.3 hours used.

## EXHIBIT III-10 (continued)

## IJO SCHEDULING

Week Ending 28 Oct 84

<u>Shop</u>	<u>Hours Avail for IJO</u>	<u>Hours Sched IJO</u>	<u>Total Hours Worked IJOs</u>	<u>Hours Worked As Orig. Scheduled</u>
01 Carpentry	384	384	361.2	328
02 Electric	275	280	336	192
03 Plumbing	123.8	123.2	139.2	123.2
04 Metal	421	442	427	307
05 Paint	360	360	296	256
06 Refer	60	0	95	0
07 Roads	488	476	543.2	170
08 Grounds	408	408 <sup>13</sup>	647.3 <sup>14</sup>	91
13 Water	0	0	24	0
14 Sewage	0	0	36	0
16 Masonry	456	456	576 <sup>15</sup>	360
17 Roofing	80	80	168	52
19 Steamfitters	650.2	650.2	556.1	406.5
SUBTOTAL	3706.0	3659.4	4205.0	2286.7
% Hours Worked as Originally Scheduled: Col. 4/Col. 2 = 62.5%				
TOTAL	17854.8	17606.7	17737.4	9999.0
% Hours Worked as Originally Scheduled: Col. 4/Col. 2 = 56.8%				

<sup>13</sup> No hours sched. for SOs - 74.1 hours used.<sup>14</sup> 1396 hours sched. for IJOs - 1033 hours used.<sup>15</sup> 536 hours estimated avail for planning -- 656 hours actually available.

## SUMMARY OF SCHEDULED 130 HOURS COMPLETED

	SCHEDULED				WORKED AS SCHEDULED				% of SKED COMPLETED					
	WEEK PERIOD ENDING 05-31-84	05-24-84	05-17-84	05-10-84	TOTAL	WEEK PERIOD ENDING 06-07-84	05-30-84	05-23-84	TOTAL	WEEK PERIOD ENDING 06-14-84	05-30-84	05-23-84	TOTAL	
01 Carpentry	323	378	332	384	1737	125	139.2	226	258	328	1076.2	1076.2	62.0	
02 Electric	137	352	392	210	1201	1371	24	208	144	128	192	696	50.8	
03 Plumbing	59.2	166.2	150.2	3.2	323.2	502	3.2	79.6	114.6	3.2	123.2	323.8	64.5	
04 Metal	358	406	398	126	1730	291	128.2	110	118	307	954.2	954.2	55.2	
05 Paint	310	371	384	308	1733	232	285	262	213	256	1248	1248	72.0	
06 AC&R	152	92	120	80	0	444	56	28	48	64.2	0	196.2	196.2	44.2
07 Roads	424	714	197	120	976	2131	40	527	92	175.8	170	1004.8	1004.8	47.2
08 Grounds	240	324	466	496	1934	0	276.2	216.2	331.2	92	915.6	915.6	47.3	
13 Water	0	0	14	0	14	0	0	0	14	0	0	0	0	100.0
14 Sewage	0	0	72	0	72	0	0	0	0	0	0	0	0	0.0
16 Masonry	389	421	504	600	2370	202	197	442	447	360	1648	1648	69.5	
17 Roofing	49	120	152	80	460	12	80	84.2	56	52	284.2	284.2	59.2	
19 Pipefitting	689.3	806	614	330.2	650.2	3088.7	316.1	460.6	398.5	56.3	406.5	1638	53.0	
<b>TOTAL</b>	<b>3125.5</b>	<b>4095.2</b>	<b>3841.2</b>	<b>2855.4</b>	<b>3659.4</b>	<b>17565.7</b>	<b>1301.3</b>	<b>2408.8</b>	<b>2151.5</b>	<b>1850.7</b>	<b>2286.7</b>	<b>9999.0</b>	<b>56.8</b>	

### Your Scheduling Meeting and Productivity

DA Pam 420-6 defines scheduling as "...the act of matching up the requirements with the resources in an organized manner." What type of "service" is your scheduling "act" receiving? Critical acclaim or just criticism?

Effective scheduling provides for the orderly and economical accomplishment of jobs as well as the orderly assignment of work to the individual shops. Your scheduler, therefore, is in a key position to affect the efficiency and productivity of your workforce.

During preparation of the weekly schedule, your scheduler must aggressively seek out all the needed information on jobs themselves and factors that will affect the scheduling of those jobs. This information gathering is the heart of scheduling. Is your scheduler trying to "wring it" with only part of the needed information? Available man-hours, current status of scheduled work, availability of materials, relative priorities, transportation, weather impacts, still availability in shops, coordination on multi-shop jobs, hours to be expended on 500's and 501's, utility cut-offs, fire protection requirements, protest material coordination, and contacting the requestor to insure access to job sites are only some of the things your scheduler needs to be aware of.

Then how about your scheduling meetings? Is it weekly or weekly? If conducted effectively, this meeting can be the most productive hour of the entire week. If not managed effectively, it can tie up highly paid employees in an unproductive "bull" session. Who attends the weekly scheduling meeting at your installation?

The following personnel should attend:

- The DER/BFC or the Deputy
  - Chief ENR
  - Chiefs of Operating Divisions
  - All Shop Foremen
  - Material Coordinator
  - Scheduler
- And what should this august group do each week?
- Identify carry-over work
  - Review new jobs for the coming week
  - Resolve problems associated with work to be accomplished
  - Determine what day the work should be scheduled, especially multi-shop jobs

DA Pam 420-6 defines scheduling as "...the act of matching up the requirements with the resources in an organized manner." What type of "service" is your scheduling "act" receiving? Critical acclaim or just criticism?

You as DER/BFC are charged with planning, directing and controlling firm work. You can do this and achieve substantial productivity gains with more effective, more accurate job scheduling.

### Scaffolding Practices

Low overall productivity is most often a result of unnecessary little inefficiencies. During a recent staff visit, we sat in on a good scheduling meeting. A multiple-shop job being reviewed included scaffold erection by the carpenter shop. The need for erection by the carpenter shop of routine scaffolding was questioned, and all the shop foremen and Division chiefs agreed that this practice wasn't necessary. Scaffolding would simply be pitched up and erected by painters, masons or other craftpersons needing routine scaffolding. Only the more complex scaffolding work would automatically be assigned to the carpenter shop. Result? Less complex scheduling (fewer multiple-shop jobs), fewer workers per job and higher productivity! Could you use this idea to improve your productivity?

### Reviewing Is Your Scheduling Operation?

Have you ever taken the time to review and analyze the effectiveness of your scheduling operation? A very simple means to gauge your scheduling efficiency is to compare, for any given week, the actual man-hour worked against man-scheduled man-hours. This percentage would then be measured against a goal established by your MACON or at your installation. A reasonable starting goal is 70%.

A more in-depth scheduling analysis procedure consists of:

- recording the cause of each scheduling change that occurred during the week.
  - setting how many times a specific cause contributes to a scheduling change.
  - investigating the major causes of scheduling disruptions. This process should be initiated by the scheduler. Variances/causes should be discussed at the weekly scheduling meeting and appropriate actions initiated to preclude recurrences.
- These types of basic analyses are essential if we are to minimize our scheduling operations and hence, reduce non-productive craft time that results from scheduling disruptions.

AETS-SFT-DEH  
STANDING OPERATING PROCEDURE  
Engineer Resource Management Division

22 September 1983

(10) Primary responsibility is to schedule IJO's.

(11) Reviews the Awaiting Scheduling Board and selects the jobs in accordance with indicated priorities or as directed so that all labor requirements can be met for the prospective scheduling period. Prior to any scheduling, the work load created by service orders and scheduling maintenance is duly considered. If no objections are raised by the members of the scheduling meeting, the preliminary schedule is confirmed and placed on the Master Schedule Board.

(12) For the scheduled jobs, unit schedules are prepared and forwarded to the shop foremen. This will be at least one day before the actual start of the scheduled period. In order to insure the schedule can be met by the shops involved, the scheduler must stay in close contact with the shop. Mutual communication between scheduler and shop foreman is indispensable on regard to man-power availability, the basis of all firm master scheduling.

(13) The Scheduling Unit closely examines the unit schedules returned by the shop at the end of the schedule period to determine if the expended man-hours correspond with the scheduled hours. In cases of deviations, the scheduler requests explanation. Shop supervisors and/or shop-foremen are required to immediately report and state reasons for any delays in work during the scheduled period. If delays are reasonably justified, the Scheduling Unit makes necessary adjustments in the schedule, and gives due consideration to such events in the subsequent preliminary master schedule. Arbitrary delays or disregard of firm master schedules are reported to Chief ERMD to effect corrective action by the DEH.

(14) Completed job orders are evaluated by comparing estimated and actual requirements with emphasis on man-hours, the essential factor in determining shop effectiveness. Deviations exceeding ten percent require detailed explanations from shop and estimators. If a reconciliation is not possible work site inspections may be conducted. Insures that turn-ins have been made. Copy # 3 of the completed and reviewed job order are forwarded to the Real Property Section. Enters actual costs and completion date on buildings record cards.

(15) Completed service orders are evaluated and posted by tasks to the service order ledger. Comparisons with the established work standards are made. Unusual divergences are analysed thoroughly.

## EXHIBIT III-14

## WORK FORCE DISTRIBUTION

<u>Shop</u>	<u>Average Daily Experience<sup>1</sup></u>		<u>Equivalent Person-Days</u>	
	<u>IJO</u>	<u>SO</u>	<u>IJO</u>	<u>SO</u>
01 Carpentry	73	52	9.1	6.5
02 Electric	116	51	14.5	6.4
03 Plumbing	23	67	2.9	8.4
04 Sheetmetal	64	64	8.0	8.0
05 Paint	70	27	8.8	3.4
06 Refer/Kitchen	46	40	5.8	5.0
10 Prev. Maint.		23		2.9
13 Water	49	11	6.1	1.4
14 Sewage	53	11	6.6	1.4
16 Masonry	106	42	13.3	5.3
17 Roofing	22	24	2.8	3.0
19 Steamfitting	115	95	14.4	11.9
	<u>737</u>	<u>507</u>	<u>92.1</u>	<u>63.4</u>

TOTAL IJO/SO Average Daily Experience

737 IJO Personhours  
 507 SO Personhours  
1,244 Personhours

---

<sup>1</sup> Data from quarterly Unit Backlog and Work Force Distribution Reports. Figures are an average of FY83 4th Qtr and FY84 1st, 2nd and 3rd Qtrs data. Average Personhours are rounded to the nearest whole number.

## EXHIBIT III-15

## SO BACKLOG

<u>SHOP</u>	<u>WORK CONTROL</u> <sup>1</sup>	<u>REPORT</u> <sup>2</sup>	<u>REPORT</u> <sup>3</sup>	<u>SHOP</u> <sup>4</sup>
01 Carpentry	65	41	118	
02 Electric	54	25	51	15
03 Plumbing	49	28	56	
04 Sheetmetal	73	69	81	13
05 Paint	73	57	72	
06 Refer/Kitchen	27	19	19	12
07 Roads	11	19	22	
08 Grounds	11	20	21	
10 Prev. Maint.	40	45		
13 Water	6	4	4	
14 Sewage	7	3	3	
16 Masonry	36	30	58	
17 Roofing	64	54	61	
19 Steamfitting	45	39	56	
<b>TOTAL<sup>5</sup></b>	<b>521</b>	<b>408</b>	<b>622</b>	
<b>TOTAL<sup>6</sup></b>	<b>154</b>	<b>113</b>	<b>151</b>	<b>40</b>

<sup>1</sup> Count of SOs in work reception files on 2 Aug 84. Includes SOs being worked on that day, any completed SOs not turned in by shops and SOs received but not yet in the shops.

<sup>2</sup> Monthly Backlog Report IJ0s, Monthly IJ0s and SOs as of 29 Jul 84.

<sup>3</sup> Quarterly Unit Backlog and Work Force Distribution Report for period ending 30 Jun 84.

<sup>4</sup> Actual shop count on various days during week of 23 Jul 84.

<sup>5</sup> Does not include Shop 10.

<sup>6</sup> Count for Shops 02, 04, and 06 only.

## EXHIBIT III-16

## COMPARISON OF REPORTED AND ACTUAL SHOP SO BACKLOG

Quarterly Unit Backlog and Work  
Force Distribution Report for Period  
Ending 30 Jun 84

	02 Elec.	Shops 04 Shtmtl	06 R/K
Avg Daily Experience - SO Personhours	58	79	45
SOs in Shop - #	51	81	19
Avg Personhours/SO	2.4	4.34	5.76
SOs in Shop - Personhours	122	352	109
SOs in Shop - Shop Days	2	4	2

Calculations Based on Actual  
Count of SOs in Shop

SOs in Shop - #	15	13	12
Avg Personhours/SO	2.4	4.34	5.76
SOs in Shop - Personhours	36	56	69
SOs in Shop - Shop Days (Using Avg Daily Experience - SO Personhours from above Quarterly Report)	0.6	0.7	1.5

## EXHIBIT III-17

## WORKFORCE DISTRIBUTION

<u>SHOP</u>	Current Avg. Daily Experience <sup>1</sup>		Recommended Avg. Daily Experience <sup>2</sup>		Equivalent Recommended Person-Days	
	IJO	SO	IJO	SO	IJO	SO
01 Carpentry	73	41	90	24	11.3	3
02 Electric	116	46	138	24	17.3	3
03 Plumbing	23	53	44	32	5.5	4
04 Sheetmetal	64	51	83	32	10.4	4
05 Paint	70	22	76	16	9.5	2
06 Refer/Kitchen	46	40	62	24	7.8	3
10 Prev. Maint.		71		71		9
13 Water	49	11	52	8	6.5	1
14 Sewage	53	11	56	8	7.0	1
16 Masonry	106	42	124	24	15.5	3
17 Roofing	22	24	30	16	3.4	2
19 Steamfitting	115	95	162	48	20.3	6
	737	507	917	327	114.6	41

Total Current: 1244 Personhours

Total Recommended: 1244 Personhours

<sup>1</sup> Data from Exhibit III-14. Current average daily experience is adjusted downward for 01 Carpentry, 02 Electric, 03 Plumbing, 04 Sheetmetal, and 05 Paint shops by an equivalent increased number of SOs that will be accomplished by establishment of additional PM shop special teams. See Exhibit III-18 for calculations.

<sup>2</sup> Fifty percent of Current Average Daily Experience rounded up to the next whole Person-Day. Remaining hours are shifted to IJO work.

## EXHIBIT III-18

## REDISTRIBUTION OF SO WORK FROM SHOPS TO ADDITIONAL PM TEAMS

<u>Shop</u>	<u>Avg Daily Experience SO Personhours<sup>1</sup></u>	<u>Less SO work to be Accomplished by Additional PM Teams<sup>2</sup></u>	<u>Adjusted Avg Daily Experience SO Personhours</u>
01 Carpentry	52	11	41
02 Electric	25 <sup>3</sup>	5	46
03 Plumbing	67	14	53
04 Sheetmetal	64	13	51
05 Paint	<u>27</u>	<u>5</u>	<u>22</u>
	235	48	213

<sup>1</sup> Data from Exhibit III-14.

<sup>2</sup> Reduction in PM team size and changes in work procedures (see discussion on PM in Section V, page V-3) there will be seven mechanics available for SO work. It is estimated that an average of six will be available for work daily or 48 hours. This 48 hours of work will comprise SO work currently accomplished by the shops discussed in this section. Reduced SO hours are prorated for each shop (48/235).

<sup>3</sup> As this shop includes exterior electric as well as interior electric work only 1/2 of the hours are considered.

## EXHIBIT III-19

## VALUE OF INCREASED WORK ACCOMPLISHMENT

<u>Shop</u>	<u>Current Avg. Daily Experience IJO Personhours<sup>1</sup></u>	<u>Recommended Avg. Daily Experience IJO Personhours<sup>2</sup></u>	<u>Diff.</u>	<u>Shop Rate<sup>3</sup></u>	<u>Diff. Value</u>
01 Carpentry	73	90	17	\$ 9.44	\$ 160.48
02 Electric	116	138	22	9.28	204.16
03 Plumbing	23	44	21	10.09	211.89
04 Sheetmetal	64	83	19	9.37	178.03
05 Paint	70	76	6	9.64	57.84
06 Refer/Kit	46	62	16	9.51	152.16
13 Water	49	52	3	12.54	37.62
14 Sewage	53	56	3	9.20	27.60
16 Masonry	106	124	18	9.36	168.48
17 Roofing	22	30	8	8.70	69.60
19 Steamftg	<u>115</u>	<u>162</u>	<u>47</u>	<u>9.26</u>	<u>435.22</u>
	737	917	180		\$1,703.08

Additional hours accomplished by additional special PM teams 48 hrs/day	9.10	\$ 436.80
Total daily value		\$2,139.88
Work days per annum		x 248
Total annual value		\$530,690.24

<sup>1</sup> Data from Exhibit III-14.<sup>2</sup> Data from Exhibit III-17.<sup>3</sup> FY84 Shop Rates provided by Baumholder DEH.

14X PREVENTIVE MAINTENANCE

<u>TASK</u>	<u>HRS</u>	<u>TITLE</u>	<u>DESCRIPTION</u>
01	.5	NO SHOW/NO ENTRY	Lost time, no work involved, work belongs to another shop, waiting for or running down keys, no one home.
02	2.3	RPR/RPL 100LF MLDG	TRIM Trim, remove old molding and replace covemold, baseboard, door or window trim . 100 LF
03	1.8	RPL CER W TILE 1SF	BATHROOM OR KITCHEN Remove old tile, clean wall, replace tile grout & clean tile. 1SF
04	1.1	RPL BATH RM ACC	Replace bathroom accessories (one ea) medicine cabinet, mirror, shower rod, toilet paper holder, soap dish, towel bar, shelf etc.
05	1.5	INST/RPL EX VENT	VENT Install/replace, dryer vent, bathroom vent, kitchen vent, attic vent, foundation vent, remove birds nest from vent.
06	.9	RPL CLG TILE 10SF	CEILINGS Remove & replace 12"X12" or 12"X24" suspended glued or stapled ceiling tile. 10 S.F.
07	1.1	RPL CLG TILE 32SF	Replace 4 EA 2'X4' suspended ceiling, lay in panels, include cutting around objects.
08	.8	RPR/RPL GYP CL 10SF	Remove old sheetrock, replace with new, clean up area.
09	2.9	RPR/RPL FRAMING 12LF	Remove & replace joist frame work nailers or furring strips 12 L.F.
10	3.5	RPL KIT CAB 2LF	SHELVING/CABINETS Fabricate new & replace existing kitchen cabinet or shelving.
11	2.5	RPR KIT CAB EA	Fabricate & replace door, repair or replace door, repair framing, replace hinges, pulls, slides, catch.
12	2.0	INST/RPL ARM CLO.	DOOR, PERSONNEL Replace or install arm type hydraulic closure mounted to top of door or jamb.
13	.9	RPR/ADJ HYD CLOSURE	Repair or readjust hydraulic arm type door closure that is mounted to top of door.
14	.9	RPL 12X12 Pane	Replace glass, 12"X12" in wood or metal door.
15	4.5	INST DR W/CLO LK	Install new door with closure, lock, and new jamb.
16	2.9	RPL DOOR	Replace door only on existing jamb, wood or metal.

14X PREVENTIVE MAINTENANCE  
(continued)

<u>TASK</u>	<u>HRS</u>	<u>TITLE</u>	<u>DESCRIPTION</u>
17	1.8	ADJ RPR DR OR JAMB	Adjust door, plane off door to fit. Tighten or replace hinges, replace lock, resail jamb.
18	1.1	RPL/INST LOCK/LATCH	Replace lock or latch, change type lock using lock convertors, steel, wood or storm door.
19	3.3	ADJUST GAR DR	DOORS GARAGE (HOUSING) Adjust tension spring or realign door.
20	6.9	RPR MECH GAR DR	Repair or replace mechanism, such as tracks, springs or rollers on garage doors.
21	1.7	RPR/RPL SRN/STRM DRS	SCREEN/STORM DOORS Repair or replace screen or storm doors. Replace screens repair frames, replace hardware.
22	1.0	RPR/RPL WEATHER STP	WEATHER STRIPPING DOORS Repair or replace weatherstrip around doors, personnel, overhead, and sliding doors. 1-14LF.
23	.8	RPR/RPL SUB FLR 10SF	FLOORS Repair or replace subfloor 1 inch lumber or plywood.
24	.8	RPR/RPL UNDLYMT 32SF	Repair or replace underlayment per 1-32 S.F. plywood, particle board, or masonite.
25	.4	RPL FLR CVRNG 10SF	Replace vinyl, asphalt tile, or linoleum per 10 S.F.
26	2.3	RPR/RPL HAND RAILS	HANDRAILS Repair or replace wood or metal handrails on porch or steps.
27	2.8	RPL TRDS/RISERS 5EA	STAIRWAY Replace up to 5 risers or stair treads on wood steps.
28	1.3	SFTY TREADS INST	Install safety tread rubber or metal on average stairway.
29	.4	RPR WD PORCH 16SF	PORCH, WOOD Replace decking or replace sills or repair steps 4'X4' average height.
30	2.4	RPL WD PORCH 16SF	Replace all material on 4'X4' wood porch with average height.
31	2.0	SEAL AROUND VENT	ROOF REPAIR Seal built up or shingle roof around vent pipe or any type flue.
32	3.3	ASPHALT SHINGLE 33SF	Remove and replace 33 SF of square butt asphalt shingles.
33	1.1	RL RFNG OVRLY 100SF	Install roll roofing over existing unserviceable roof.
34	1.8	RMV/RPL RL RF 100SF	Remove old roll roofing and install new roofing.
35	.4	RPR SMALL LEAK	Repair small leak on built up, shingle or metal roof.

14X PREVENTIVE MAINTENANCE  
(continued)

<u>TASK</u>	<u>HRS</u>	<u>TITLE</u>	<u>DESCRIPTION</u>
36	.8	RPR/RPL RF SHTG 10SF	Remove and replace 10 S.F. of roof sheeting, 1" or plywood material.
37	.2	RPR/RPL FCA BD 10LF	Remove & replace fascia board regardless of width.
38	1.1	SHEETROCK RPL 4X8	<p style="text-align: center;">WALLS</p> Move and reinstall 1 piece 4X8' sheetrock on wall up to 9' ceiling.
39	.8	SHTRK, PATCH HOLE 1'	Patch hole in sheetrock wall up to 12" include install nailers.
40	.8	RPL TLE 12"X12" 10SF	Replace 12"X12" acoustical tile 10 S.F. on wall.
41	1.4	TAPEING DRYWALL 32SF	Drywall and tape 32 S.F. sheetrock 3 coats and sand, wall or ceiling.
42	.4	STRP W/WD STRPS 32SF	Strip wall with wood batten strips, can also be used on ceiling 32 S.F.
43	.8	HNG BLTN BRDS OR SGN	<p style="text-align: center;">SIGNS OR BULLETIN BOARDS</p> Hang any size of bulletin board or wood sign from ceiling or wall.
44	1.0	CAULK WINDOWS 1EA	<p style="text-align: center;">WINDOWS METAL OR WOOD</p> Caulk or recaulk metal or wood window.
45	.5	RPL WINDOW SCREEN	Replace window screen on any size wood or metal storm screen combination.
46	.8	RPR/ADJUST WINDOW	Readjust & Align window sash, replace latch or any small part on window.
47	1.4	RPL MAJOR WIN PARTS	Replace any part on window or sash includes balance.
48	1.2	RPL WIN GLASS	Replace window glass or plexiglass up to 4'X4', glazed, thermopane, or fab thermopane.
49	1.0	RPL TRAVERSE ROD	Repair, restring, replace any size traverse rod or vtn blind.
50	.8	RPL MTL SDNG/TM 10SF	<p style="text-align: center;">SIDING &amp; METAL TRIM</p> Replace metal siding or trim on structure, skirting or flashing.
51	.8	INS MTL SDG/TRM 10SF	Install 10SF metal siding, flashing, or trim on structure or skirting.
52	.8	RPL WOOD SIDING 10SF	<p style="text-align: center;">SIDING, WOOD OR MASONITE</p> Replace 10 S.F. wood or masonite siding, board & batt, or on shed doors.
53	.8	INSTL 10SF WD SDNG	Install 10 S.F. of wood, masonite, board & batt or drop siding.

14X PREVENTIVE MAINTENANCE  
(continued)

<u>TASK</u>	<u>HRS</u>	<u>TITLE</u>	<u>DESCRIPTION</u>
54	1.1	RPR WATER LEAK	PLUMBING Repair water leak in supply line, water fountain, commode sink, lavatory or urinal. Traps or drains.
55	1.1	UNSTOP TRAP	Unstop plug drain on urinal, bathtub, sink, lavatory & shower.
56	3.2	UNSTOP ALL DRAINS	Unstop drain below trap by removing fixture or from vent pipe.
57	1.2	RPL TRAP-SUPPLY	Replace S or P trap on sink, lavatory, urinal, fountain & replace flexible supply line on above items also shut off valves.
58	1.2	RPR LEAK FAC	Repair leaking faucets, replace washers, o-rings, handles reseat valves, or interior faucets, repair flushometer ballcock assembly.
59	1.4	RPL FAC-VALVES	Replace faucets on kit, mop and lavatory units. Replace flush valves, & ballcock assembly.
60	4.2	RPL FIXTURES	Replace water closets, sinks, urinals.
61	1.5	RPR/RPL GARB DISP	Unstop, repair or replace garbage disposal.
62	1.3	RPL SHOWR HD PTS	Replace trip lever, head faucet or face on shower head assembly.
63	1.1	CAULK TUBS/SHOWRS	Recaulk bathtub or showers install water wings on bathtubs or showers.
64	2.5	RPL EXTR FAUCET	Replace exterior faucet & valves.
65	2.5	RPR PLAYGRD EQ 1 PC	PLAY EQUIPMENT Repair/replace teeter-totter sandbox, sliding board.
66	2.8	RPR CLOTHES LINE	CLOTHES POLE/LINE Repair or replace clothes line poles, anchors or structure.
67	1.9	RPR GTRS DNW SPT 10'	GUTTERS-DOWN SPOUTS Replace/repair 10' sections of gutters, downspout, splash block.
68	1.5	RPL ELEC WIRE 25'	ELECTRIC Remove/replace electric wire any size.
69	1.1	RPR/RPL DR BUZZER	Repair or replace door buzzer bell or transformer.
70	1.3	RPL CIRCUIT BRK	Install or replace 110 volt or 220 volt circuit breaker.
71	.7	RESET CIRCUIT BRK	Reset breaker or replace fuse in panel or disconnect switch.

14X PREVENTIVE MAINTENANCE  
(continued)

<u>TASK</u>	<u>HRS</u>	<u>TITLE</u>	<u>DESCRIPTION</u>
72	1.1	RPL TOG SWITCH	Replace toggle switch 1 P, 3 or 4 way timer switch or dimmer switch.
73	1.1	RPL RECEPTACLE	Replace 115 or 230V receptacle.
74	.4	RPL COVER PLATE	Replace receptacle or SW cover.
75	1.2	RPL LIGHT FIXT	Replace lighting fixture any type.
76	1.5	RPL SMOKE DET	Replace smoke detector battery or 110 volt.
77	1.5	REPAIR LIGHT FIXT	Replace ballast, replace socket fluorescent ends or starter.
78	1.2	HTR ELE RPL	Replace water heater element in H-W heater or pop off valve.
			MISCELLANEOUS
79	1.5	RPL/CLEAN AF	Clean or replace air filter.
80	1.5	CLOTHES DRYER	Check vent, voltage or relays.
81	.4	FURNACE PILOT	Check out for no heat or pilot light out, replace thermo-couple.
			PAINT
82	3.3	PNT RM 10X12	Prepare surface and paint one room 10' x 12', cut in around doors/windows and ceiling.
83	1.6	TOUCH UP RM 10X12	Spot paint or paint only a portion of 10' x 12' room.
84	1.0	PNT DR WINDOW	Paint door and jamb or paint window and jamb or similar item.
85	1.0	TRIM MTL 100 LF	Paint 100 l.f. or stain and varnish 50 l.f. base, door, window casing, etc.
86	1.2	PNT EXTR 10X10	Paint exterior surface of wood or masonite siding.
87	1.8	STAIN VARN 20 SF	Stain & varnish two coats, 20 s.f. sand between coats. Windows, doors, cabinets, etc.
88	6.0	STRIP REFINISH	Strip old varnish, restain and varnish surface, sand between coats. 20 s.f. of doors, cabinets.
89	.5	MIX BLEND 1 GAL	Mix paint or stain to establish color or to match colors.
90			
91			
92			
93			

## EXHIBIT III-20 (Continued)

14X PREVENTIVE MAINTENANCE  
(continued)

<u>TASK</u>	<u>HRS</u>	<u>TITLE</u>	<u>DESCRIPTION</u>
94			
95			
96			
97			
98	3.0	TRANS TO LAKE	One round trip to Lake Ozark Rec. for maintenance and repair.
99		DUMMY TASK FOR SOO DO NOT USE FOR SO OR PM	

SERVICE ORDER BACKLOG

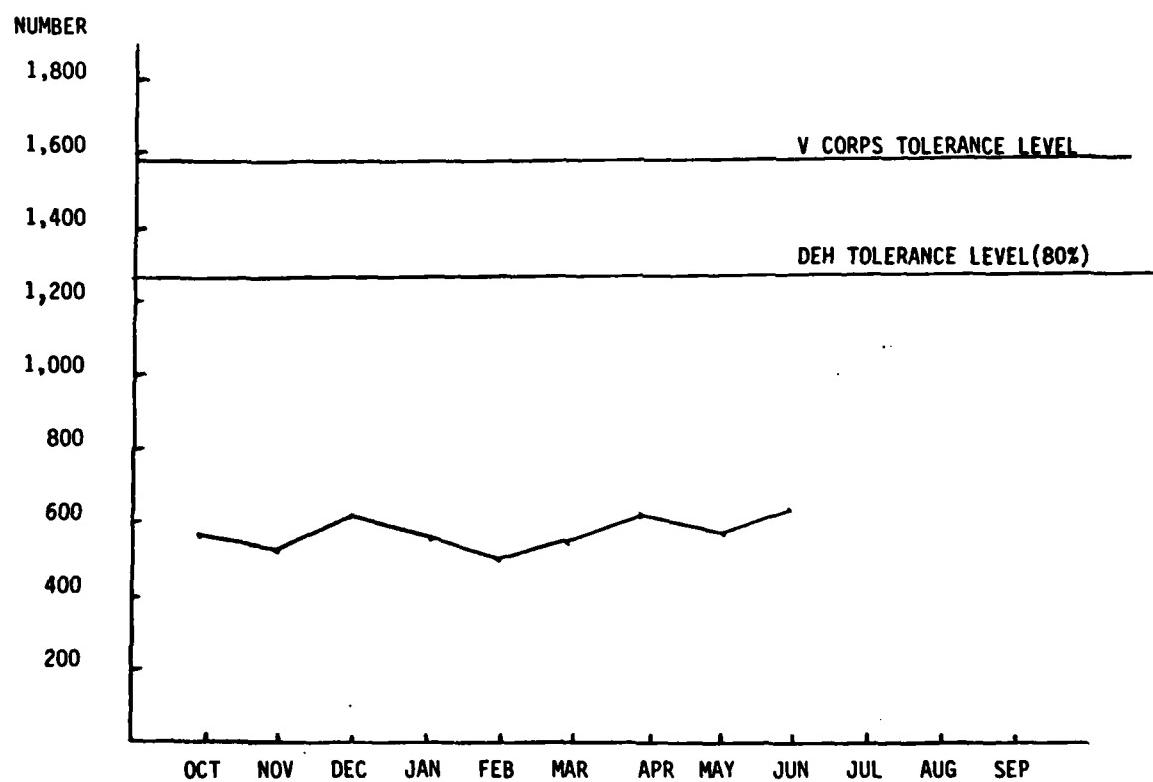


EXHIBIT III-21 (Continued)

JOB ORDER REQUEST BACKLOG

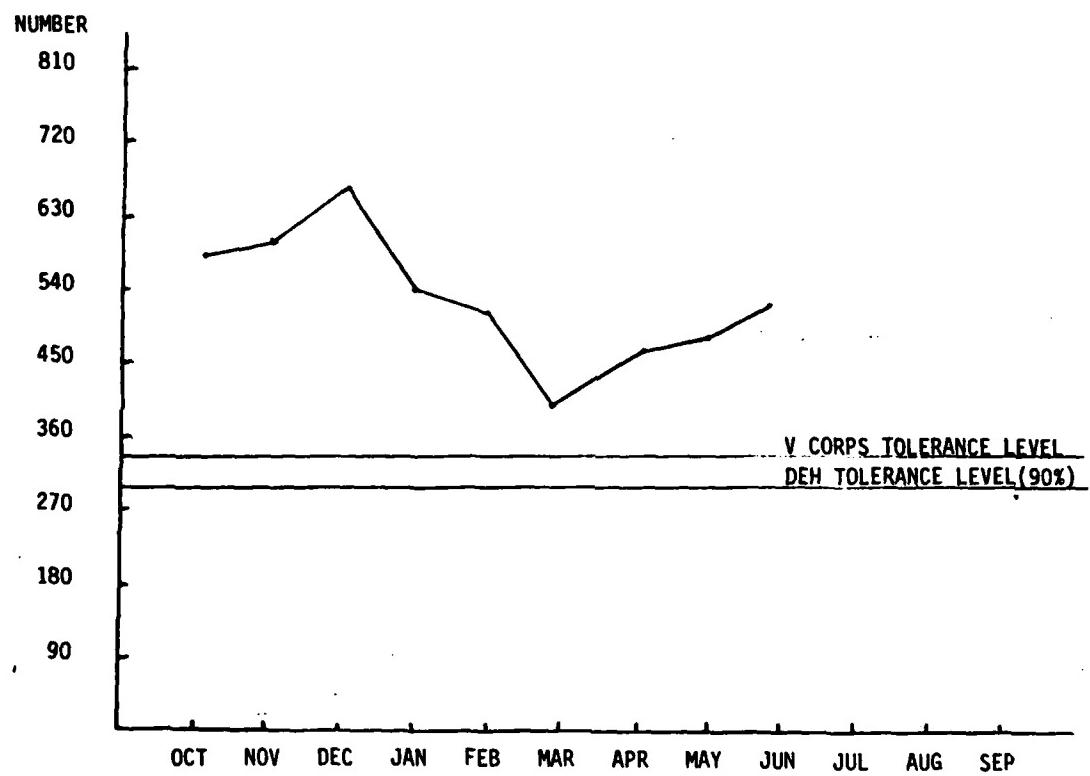


EXHIBIT III-21 (Continued)

AVERAGE PERSON-HOURS PER SERVICE ORDER

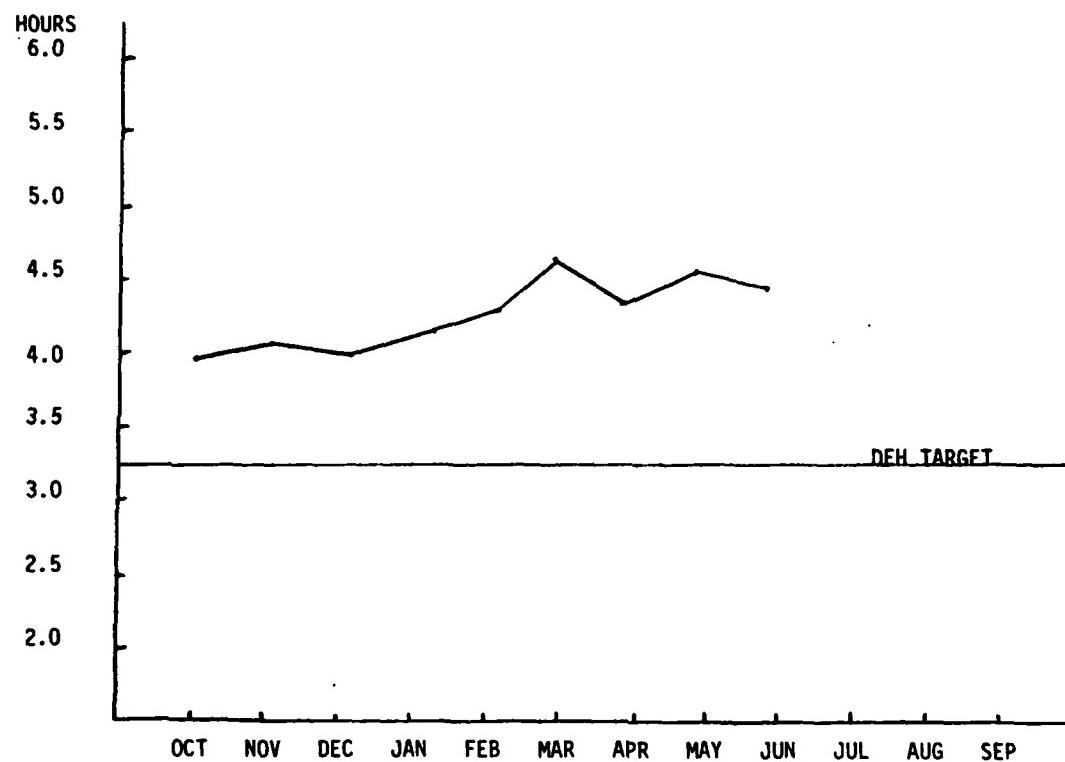
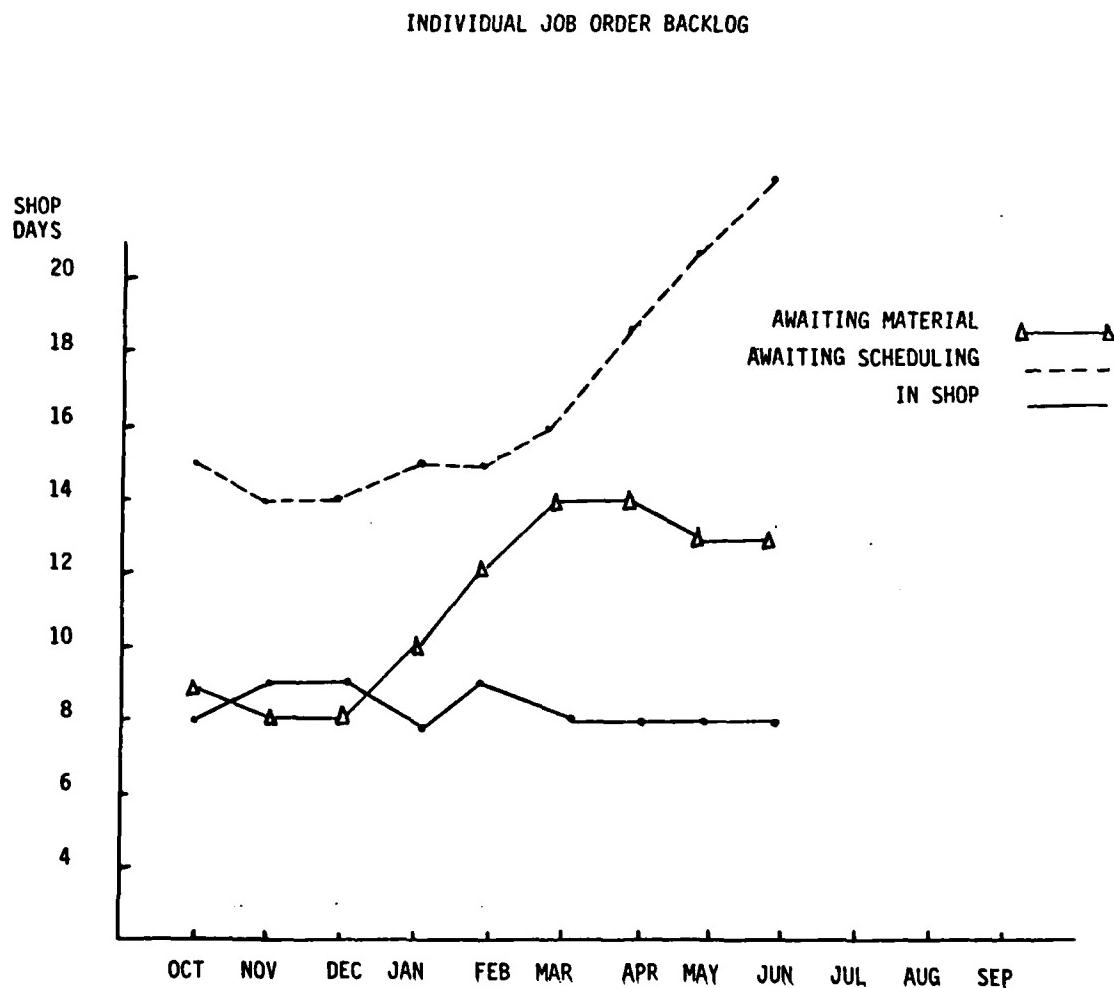


EXHIBIT III-21 (Continued)



SECTION IV  
ENGINEERING PLANS AND SERVICES DIVISION

4.0 INTRODUCTION

A review was made of the functions which are the responsibility of the EPSD. The following items require corrective action.

4.1 Project Control Procedures

A. Finding. The Engineering Plans and Services Division (EPSD) tracks various categories of projects and plans workload assignments using the following listed reports:

- FY XX EPS Annual Work Plan
- Project Status List - Family Housing
- DODDS Facility Branch 5 Year Plan - OMA Project Report
- FY XX OMA Account
- New Work Project Summary
- Procurement Status List
- OMA (OSHA) Projects
- Non-Appropriated Funds Projects
- Project Engineer Assignments
- Military Construction Program

No single report contains all active projects status.

B. Conclusion. The Chief EPSD advised that he intends to integrate all active projects into the EPS Annual Work Plan Report but no timeframe has been established. Three additional fields should be added to the program for ease in extracting data. They should be (1) customer identification (not all project ID numbers are identified the same as OMA projects, i.e.

MCA); (2) a code to identify the projects by type (OMA New Work, MCA, OSHA, DODDS, etc.); and (3) EPSD Project Engineer.

C. Recommendation. Modify the current program in the WANG Computer for the EPS Annual Work Plan to accept the additional fields and to sort by customer, by project (fund) type, or by Project Engineer. Set a schedule for modifying the computer program and combining the data. Our experience has been that if schedules are not set for planning purposes it is unlikely a given event will happen.

#### 4.2 Real Property Inventory

A. Finding. As of the initial on-site visit there were 180 temporary DD 1354s, Transfer and Acceptance of Military Real Property, outstanding. Europe Division, Corps of Engineers, owed the DEH 133 cards and the Engineer Management Center, V Corps, owed 47 cards (Baumholder Military Community Letter AETV-BHR-EP of 24 May 1984). Beneficial occupancy had occurred but contract closeout had not.

B. Conclusion. There are many areas where the lack of accurate Real Estate Inventory information impacts on the decision making process. The major areas are in justifying annual budget requests for maintenance of facility and utilities operations. A third is in measuring the effect of the Energy Conservation Program which is a very high visibility program. For example only 108,000 sq. ft. of facilities have been added to Baumholder's inventory from June 83 to June 84, a 0.9% increase, while energy consumption for June 84 was 28.2% over June 83 -- totally misleading without the 180 facilities added to the inventory. Temporary DD 1354s should be provided by the construction agent representative at the Beneficial Occupancy Inspection.

C. Recommendation. The person assigned the responsibility of accepting the facility from the construction agent at the Beneficial Occupancy Inspection should contact the construction agent's representative prior to the inspection, either orally or in writing, and make acceptance conditional on receipt of the temporary DD 1354.

#### 4.3 Directives Availability

A. Finding. Pertinent Army directives and supplements are not readily available at the working level. While reviewing project control procedures the lack of directives was evident in Master Planning and on a random basis they were not available throughout the organization where they should be available for ready reference.

B. Conclusion. The Chief, Master Planning Section, acknowledged this situation and stated that a letter requesting the directives needed to guide his daily work had been requested. A copy of his request could not be located in the DEH files. A followup request was to be sent.

C. Recommendation. Continue to follow up on the request for directives. The DEH Administration Division should query the divisions a minimum of semi-annually as to requirements. An index of current directives for DA USAEUR and V Corps should be provided each division for their reference and review as to what is needed.

## SECTION V

### \* \* \* MAINTENANCE DIVISIONS \* \* \*

#### 5.0 INTRODUCTION

While the Baumholder Military Community is organized into a Buildings and Grounds Division and a Utilities Division, results of observations made by HAMM ASSOCIATES are applicable to shops of both divisions. Accordingly, the following discussion applies to shop operations of both divisions.

#### 5.1 Shop SO Work Management

A. Finding. Management of SO work at the shop level is characterized by procedures and actions which the supervisor can influence and by those which are beyond his control to influence.

Two primary factors that are detrimental to increasing productivity at the shop level are inadequate vehicle resources and excessive scheduling of shop SO hours by ERMD. The first factor is addressed later in the section; the second has been discussed in Section III, paragraph 3.6, page III-13. There remains several areas, as observed during work sampling, that shop supervisors can influence.

Observations made during work sampling revealed the following (see Detailed Analysis of the Work Sampling Study, Appendix A to Section II, page II-11, and Exhibit II-9, page II-34, Work Sampling Examples, for additional detail):

- Multiple trips to shop for tools and/or materials following initial visit to the job site.
- Multiple trips to the maintenance vehicle for tools and/or materials following initial visit to the job site.
- Worker call in or return to shop to check on priority work in the shop.

- Crisscrossing travel patterns by maintenance personnel during the course of the day.
- Occasions of not being able to locate the customer at the job site.
- Multiple craftspersons scoping a job that required shop planning (e.g., major SO work).
- Return of craftspersons to shop for breaks and for lunch.
- On several occasions, workers did not turn in to the supervisor all SOs he had completed that day.
- Craftspersons expending significant time cleaning up the job site.

The time actually spent on service orders is not being reported accurately. Exhibit V-1, page V-10, is an analysis of the times recorded on completed service orders by the workers against that reported by the foremen to the scheduler. Approximately 556 hours are unaccounted for.

B. Conclusion. Improved work management at the shop level will increase worker productivity.

Adoption of the following recommendations will increase productivity of the workforce.

C. Recommendations.

- SO teams should be assigned a minimum of one-half day's work, preferably a full day's work,. Recommendations for balancing SO workloads and SO teams are presented in Section III, page III-13.
- Job planning by craftspersons should be accomplished prior to departing the shop. A preliminary review of SO work descriptions will frequently provide the required information to identify equipment and material requirements. Work routes should also be determined at this time (Group SOs by geographic location). The supervisors should discourage frequent return trips to the shop and should be aware of and monitor the causes, and take action to correct excessive travel. (On one occasion, a tile laying team did not have a cutting tool. This resulted in idle time while a return trip to the shop was made to obtain an obviously required tool.)

- Work reception should facilitate craftsperson job planning by ensuring completeness of SO form information, to include as accurate a diagnosis of the problem as is possible, exact job location, point of contact and telephone number.
- Planning of major SO work should be accomplished by the shop supervisor or his assistant to determine shop resources (equipment, materials and personnel) required and estimated hours to complete the task.
- Approved truck stock lists should be developed for each shop. This will facilitate replenishment, establish usage data, and reduce travel to shops.
- Provide workers with tool boxes and require them to be taken from the truck to each job location.
- The supervisor should collect all SOs at the end of the days. (Some workers were observed holding on to completed SOs.)
- When jobs have substantial clean-up requirements, schedule low skilled grounds workers to accomplish the task.
- Institute a policy of taking breaks on the job site and either eating lunch at the job site or nearby. One installation studied by HAMM ASSOCIATES, that was exceptionally highly productive, provided individual insulated lunch boxes for its workers.
- Equip several vehicles that would respond to priority maintenance requirements with radio communications.

If shop productivity is to improve the shop foremen must make an accurate accounting of the time spent by their personnel in the various work categories. Accurate data is required in order to perform a valid analysis on which management can make reasonable decisions.

## 5.2 Preventive Maintenance

A. Finding. Recurring minor building and structure preventive maintenance is accomplished by the PM shop.

To accomplish this function, the shop is organized into teams of craftspersons (carpentry, electrical and plumbing). The teams are assigned to geographical areas and operate from shop vans. During times

of a craftsperson's absence, other team members cover the absent craftsperson's work areas. Selected PM teams perform individual SO/IJO work. PM inspectors precede teams scheduled to accomplish work in troop billeting. They inspect approximately every other billet on the schedule identifying work for the team and initiating SOs or IJOs when required. Workload for the teams is based on TM 5-610 standards and monthly IJOs are issued to the shop for accomplishment. There are 3 PM cycles each 12 months.

Observations of 60 hours of PM work during work sampling revealed the following type tasks being accomplished.

<u>Task</u>	<u>Occurrences</u>
Inspection/looking for work	10
Changing light bulbs/tubes	43
Changing light ballast	2
Checking lights	4
Cleaning/straightening/adjusting light reflectors	8
Checking/adjusting/repairing lights/switches/ outlets/cords	32
Repairing/adjusting/lubricating doors/windows/hardware	48
Minor plumbing repairs	15
Repairing water fountain	1
Installing/removing/replacing plumbing piping	3
Minor miscellaneous repairs	22

B. Conclusion. The PM system presently employed is neither efficient nor effective.

The concept of geographic team zones is a good one. However, team composition and staffing is inefficient. Based on work sampling observations, the PM shop is accomplishing a significant amount of handyman and self-help work that does not require journeyman-level craftspersons. Some tasks, such as lubricating doors and windows where no problems exist, do not appear to be warranted.

The shop foreman stated that he preferred shop personnel to change fluorescent light tubes because the troops were likely to damage fixtures when installing them. This is a high occurrence task; however, the procedure for accomplishing this task was not provided during self-help instruction. (See Section III, paragraph 3.5, page III-9.)

Supervisory personnel also stated that with the conversion of troop billets into more habitable living facilities (conversion to rooms, upgraded bathrooms/shower facilities, additional lighting, ventilators, electrical outlets, etc.), that the PM standards were no longer valid. Observation of work, however, indicates that though this may in fact be the case, it is offset by less than 100 percent PM coverage. For example, in one troop billet, keys for 10 of 40 rooms were not available, and the PM team did not enter those areas. Also in family housing if the occupant informs the team that there are no maintenance problems, the team will bypass those units. In fact, much of the PM effort is expended on requirements generated by the building occupants.

Inspection of facilities is not comprehensive and was observed to be a function of time available; i.e., if a team is ahead of schedule, an increased amount of time is expended "looking" for work and vice versa.

With an enhanced self-help program as discussed in Section III, paragraph 3.5, page III-9, and accomplishing work identified on the building coordinator deficiency lists, the current PM cycles/projected workload can be accomplished by two man teams comprised of maintenance mechanics.

The current TDA shows 31 PM mechanics organized into 8 regular PM teams and 3 special PM teams which perform SO/IJO work. Current shop assignments show 23 craftspersons in the regular PM teams and 8

craftspersons on the special PM teams. Reducing the regular PM team composition to two maintenance mechanics will free up seven workers to augment the special teams in accomplishing additional specific SO/minor IJO work. Numerous studies of other DEH organizations conducted by HAMM ASSOCIATES have shown that a very significant portion of SO and minor IJO work can be accomplished by multi-skilled workers vice single skilled craftspersons.

Adoption of the new reorganization and staffing concept will have the net effect of accomplishing seven additional person-years of DEH work and a net per annum savings of \$72,163 as shown below.

Total PM mechanic cost (DM)	DM	866,082
(from Exhibit II-4)		2.71
Conversion at DM 2.71 = \$1		\$319,587
Total PM Mechanic Cost (\$)		31
Average PM mechanic cost		\$10,309
Spaces saved	x 7	
Cost Avoidance/Additional Work Accomplished		\$72,163

The actual cost savings will be translated into additional backlogged IJO work accomplished by other Buildings and Structures shops. These shops will accomplish an equivalent seven person-years less of SO work which will be shifted to the PM shop. This will require approximately doubling the amount of work slotted to the PM shop by the work control section.

The nature of shop work should drive composition of teams and not vice versa as is often the case. Shop planning for special team work assignments should ensure that one-man jobs are grouped (geographically when possible) and provided to a single PM mechanic for accomplishment. Team composition for accomplishment of minor IJOs/major SOs should also be a function of the most efficient staffing to accomplish that particular job.

### C. Recommendations

- Develop a Military Community "building coordinator" system for all occupied buildings. The coordinator would be the focal point for all maintenance requirements. A running list of minor maintenance deficiencies would be maintained and this would comprise the work of the PM team. Additional deficiencies observed by the teams would be handled as is currently done. Tasks and task units should be documented for future analysis. After approximately six months under the new system, Management Engineering Systems Branch should analyze the data and make adjustments if required. Self-help work would not be accomplished by PM.
- In family housing areas, provide an easily visible (red) placard to place in the window when maintenance is required. This will eliminate lost time dealing with occupants that have no maintenance deficiencies.
- Staff the PM team with maintenance mechanics and reorganize into two man teams comprised of one maintenance mechanic graded at the equivalent craftsperson level and one graded at a lower level (maintenance mechanic worker).
- In those facilities where it is not a self-help requirement, designate a lower graded worker to change all lights.
- Utilize the excess seven workmen in accomplishing SOs. This will approximately double the number of SOs accomplished by the PM shop.

### 5.3 Vehicle Utilization

A. Finding. There are 54 maintenance vehicles supporting an average daily mobile blue collar work force of 155 workers.

Data provided by the Equipment Maintenance Branch shows 54 vehicles assigned to 11 blue collar shops performing SO/IJO work. Analysis of Land Management Branch and Roads and Railroads Branch are not included as they are supported primarily by M&S equipment organic to those branches. This total also excludes the nine shop vans in support of the recurring maintenance workload of the PM shop; however, PM special team workload and vehicle requirements is included in the analysis. (See Exhibit V-2, page V-11)

Data from the Unit Backlog and Work Force Distribution reports reveals that the average daily work force availability for SO/IJO work for the shops analyzed is 155.5 workers (See Exhibit V-3, page V-12). The distribution of these workers is 40.8 percent (63.4/155.5) performing SO work and 59.2 percent (92.1/155.5) performing IJO work. The ratio of workers to vehicles is 2.88:1.

Observations made during work sampling revealed overmanning of SO teams and frequent return trips to shops for material, tools and additional work. (See also Section III, page III-6, on SO work management.)

B. Conclusion. Inadequate vehicle resources are a primary contributor to low worker productivity in accomplishing SO work.

Although SO work is inherently less productive than other type work, the lack of adequate vehicle support is a major obstruction to increasing SO productive time. The frequent observations made during work sampling of multi-worker SO teams on one man jobs were made during a period of high annual leave. During low annual leave periods, additional worker availability compounds the problems caused by limited vehicle assets.

To realize the full productive potential of these shops, the DEH should adhere to the general principle of single-worker SO teams. If the recommendations for revisions in procedures for accomplishing PM shop work (Section V, page V-3), enhancing the self-help program (Section III, page III-9) and reducing the scheduled shop SO hours (Section III, page III-13) are adopted, the result will be a more efficient workforce.

The prerequisite for realization of these increased efficiencies is the allocation of 29 additional maintenance vehicles.

The vehicle requirement is based on the recommended scheduled SO hours shown in Exhibit V-4, page V-13. Scheduled hours would be reduced from a daily average of 63.4 workers assigned SO work to 41 workers (This includes 6 additional PM shop workers assigned to special teams) with a worker to vehicle ratio of 1:1, or 41 vehicles. IJO hours would be increased from a daily average 92.1 workers (equivalent) to 114.6 workers, with a worker to vehicle ratio of 2.7:1, or 42 vehicles. This ratio has been found to be adequate to support IJO work at CONUS installations studied by HAMM ASSOCIATES. Further, vehicle support for IJO work is not as critical as workers can be delivered to the job site with little loss in productive time. The requirement then, is for 29 (83-54) additional vehicles. (The above figures do not include the nine shop vans currently in the PM shop which continue to be recognized as a requirement and for which no change is recommended.) The recommended worker to vehicle ratio is 1.87:1.

The total cost of 29 vehicles over the economic life of the vehicles is \$321,726 (capital cost of \$174,000 and operation and maintenance cost of \$147,726) or a per annum cost of \$53,621 (\$321,726/6). Exhibit V-5, page V-14, shows the calculations.

C. Recommendations

- That 29 additional maintenance vehicles be allocated to the Baumholder Military Community DEH.
- That sufficient shop vehicles be equipped with 2-way radios to handle emergency work.

## EXHIBIT V-1

SERVICE ORDER ACTUAL TIME vs. REPORTED TIME  
RANDOM SAMPLE - COMPLETED SOs

<u>Shop</u>	#SOs	<u>ACTUAL (WORKER)</u>		<u>REPORTED (FOREMAN)</u>		<u>Diff B-A</u>
		Total <u>Hours</u>	Avg <sup>1</sup> <u>Hrs/SO</u>	#SOs	Total <u>Hours</u>	
01 Carpenter	25	84.5	3.4	148	483	3.3
02 Electrical	42	90.0	2.1	324	656	2.0
03 Plumbing	53	106.0	2.0	387	740	1.9
04 Metal	37	69.7	1.9	281	841	3.0
06 Refer	24	114.0	4.8	151	822	5.4
10 PM	28	101.8	3.6	119	416	3.5
13 Water	18	221.0	12.3	18	261	14.5
14 Sewage	12	97.0	8.1	31	251	8.1
16 Masonry	41	261.4	6.4	41	308	7.5
17 Roofing	23	152.0	6.6	31	156	5.0
19 Steamftrs	28	181.5	6.5	136	955	7.0

Unaccounted For Hours - July 84

04 Metal      281 SOs x 1.1 hours = 309.1 hours

06 Refer      151 SOs x 0.6 hours = 90.6 hours

13 Water      18 SOs x 2.2 hours = 39.6 hours

16 Masonry      41 SOs x 1.1 hours = 45.1 hours

19 Steam      136 SOs x 0.5 hours = 68.0 hours

17 Roofing      = 4.0 hours

TOTAL      556.4 hours

Roofing - A 100% review of SOs for July 84 determined roofers worked 152 hours versus 156 hours reported. Only 23 SOs accounted for versus 31 reported.

<sup>1</sup> Hours as recorded by workers on completed SO forms sampled.<sup>2</sup> Hours reported to the Scheduler as used.

## EXHIBIT V-2

VEHICLE DISTRIBUTION<sup>1</sup>

<u>Line No.</u>	<u>Nomenclature</u>	<u>33</u>	<u>TDA Para. No.</u>	<u>33A</u>	<u>34A</u>	<u>34B</u>	<u>34C</u>	<u>Total</u>
S-128CZ	3 Whl Scooter		1					1
S-80048	Platform Truck				1			1
T-53919	1/2T Maint. Trk.		1			1		2
X-53432	1-1/2T Maint. Trk.			2	2	1		5
X-53572	3/4T Maint. Trk.	8		9		3		20
X-53848	Panel Trk.		4					4
X-53851	3/4T Maint. Trk.		4	3	2	1		10
X-54200	1-1/2T Maint. Trk.	4		1				5
X-54805	Panel Trk.	—	—	3	3	—	—	6
<b>TOTAL</b>		<b>4</b>		<b>22</b>	<b>17</b>	<b>5</b>	<b>6</b>	<b>54</b>
X-62487	Shop Van (for PM shop recurring maintenance work)			9				9

<sup>1</sup> Data from Chief, Equipment Maintenance Branch.

## EXHIBIT V-3

## WORK FORCE/VEHICLE DISTRIBUTION

TDA Para. No.	Shop	Average Daily Experience <sup>1</sup>			
		Person-Hours		Equivalent Person-Days	
		IJO	SO	IJO	SO
33A	01 Carpentry	73	52	9.1	6.5
34B	02 Electric	116	51	14.5	6.4
34A	03 Plumbing	23	67	2.9	8.4
33A	04 Metal	64	64	8.0	8.0
33A	05 Paint	70	27	8.8	3.4
34A	06 Refer	46	40	5.8	5.0
33A	10 PM		23		2.9
34C	13 Water	49	11	6.1	1.4
34C	14 Sewage	53	11	6.6	1.4
33A	16 Mason	106	42	13.3	5.3
33A	17 Roof	22	24	2.8	3.0
34A	19 Steamftg	115	95	14.4	11.9
TOTAL		737	507	92.1	63.4

CONSOLIDATION BY TDA PARA. NO.

				Veh. Dist. <sup>2</sup>	Wkrs/ Veh.
33A		335	232	41.9	29.2
34A		184	202	23.0	25.3
34B		116	51	14.5	6.4
34C		102	22	12.8	2.8
TOTAL		737	507	92.1	63.4

Total Equivalent Person-days per day = 92.1 + 63.4 = 155.5 workers per day.

<sup>1</sup> Data from Exhibit III-14, page III-40.

<sup>2</sup> Data from Exhibit V-2. It does not include nine shop vans (Line No. X-62487) used by Baumholder regular PM teams, nor does it include the shop monthly IJO hours.

## EXHIBIT V-4

## RECOMMENDED VEHICLE DISTRIBUTION

<u>SHOP</u>	<u>Current Avg. Daily Experience<sup>1</sup></u>		<u>Recommended Avg. Daily Experience<sup>2</sup></u>		<u>Equivalent Recommended Person-Days</u>		<u>Recommended Vehicle Distribution</u>		
	<u>IJO</u>	<u>SO</u>	<u>IJO</u>	<u>SO</u>	<u>IJO</u>	<u>SO</u>	<u>IJO</u>	<u>SO</u>	<u>TOTAL</u>
01 Carpentry	73	41	90	24	11.3	3	4	3	7
02 Electric	116	46	138	24	17.3	3	6	3	9
03 Plumbing	23	53	44	32	5.5	4	2	4	6
04 Metal	64	51	83	32	10.4	4	4	4	8
05 Paint	70	22	76	16	9.5	2	3	2	5
06 Refer	46	40	62	24	7.8	3	3	3	6
10 PM		71		71		9		9	9
13 Water	49	11	52	8	6.5	1	2	1	3
14 Sewage	53	11	56	8	7.0	1	3	1	4
16 Mason	106	42	124	24	15.5	3	6	3	9
17 Roof	22	24	30	16	3.4	2	1	2	3
19 Steam	115	95	162	48	20.3	6	8	6	14
	<u>737</u>	<u>507</u>	<u>917</u>	<u>327</u>			<u>42</u>	<u>41</u>	<u>83</u>

Total Current: 1244 Personhours

Total Recommended: 1244 Personhours

Shop Van (for PM shop recurring maintenance work)

9

<sup>1</sup> Data from Exhibit III-17.<sup>2</sup> Ibid.

## EXHIBIT V-5

## ESTIMATED ANNUAL COST OF ADDITIONAL VEHICLES

Vehicle : VW 1-1/2 Ton Maintenance Truck  
 Lin. No. : X-53432  
 NSN : 2320-01-090-9566  
 Cost<sup>1</sup> : \$6,000  
 Economic Life<sup>2</sup> : 6 years or 72,000 miles

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Estimated Annual Miles <sup>3</sup>	8,006
Cost per Mile <sup>4</sup>	\$ .106
Estimated Total Annual Operating Cost	<u>\$ 849</u>
Estimated Total Economic Life	
Operating Cost <sup>5</sup>	\$5,094
Cost of Truck	\$6,000
Estimated Total Economic Life Cost	<u>\$11,094</u>
Estimated Total Economic Life Cost	
for 29 Trucks	\$321,726
Estimated Total Cost for One Year	\$53,621

<sup>1</sup> Data from SB 700-20, Chapter 6, dated 1 Sep 1983.

<sup>2</sup> Data from AR 58-1, Figure 2-1, dated 15 Dec 1979.

<sup>3</sup> Data from Equipment Maintenance Branch Non-Tactical Vehicle (NTV) Cost Report dated Nov 1983 for 69 vehicles (with the following last four NSN digits: 9539, 7825, 9566, 1991, 7313, 3970, 9565 and 7840). There was a total of 552,411 miles recorded for these vehicles.

<sup>4</sup> Ibid. Cost per mile calculated using data for eight 1-1/2 ton trucks with last four NSN digits: 9565 and 9566.

<sup>5</sup> Inflation factor not calculated.

SECTION VI  
SUPPLY SUPPORT  
AND  
EQUIPMENT MAINTENANCE

6.0 INTRODUCTION

This section contains an analysis of the supply system and equipment maintenance support.

6.1 Supply Management Procedures

A. Finding. An analysis was made of the supply management procedures in place as compared to those required by Headquarters V Corps Standing Operating Procedure (SOP) - RPMA Material Management and Sub-warehouse Operations dated 6 Jan 1981.

B. Conclusion. The instructions and procedures required by the V Corps SOP are being followed. The required record keeping and stock control procedures are functioning properly. Only the zero balance rate could not be determined without an inventory. With the installation of the FESS program this data will be routinely available. We were advised that the zero balance equates to approximately half the number of items on the Back Order Listing. This being the case the zero balance as of the on-site visit was approximately 19 items or approximately one percent of the authorized stock list of 1811 items.

Exhibit VI-1, page VI-9, is a graphic display of the number of line items on back order over the previous 18 months beginning with Julian Date 4151.

C. Recommendation. In view of the pending implementation of FESS no procedural changes in the manual record keeping procedures are recommended as they would only tend to create confusion during the changeover to FESS and be counter productive.

## **6.2 Warehouse Stock Support**

A. Finding. For the 12 to 18 months prior to this study there was an average of 126 unfilled orders carried on the Back Order Register. For the eleven months immediately preceding the study the average was 51 items -- a 60% improvement. Exhibit VI-1, page VI-9, is a graphical display of this information. As pictured on Exhibit VI-2, page VI-10, an average 60% of the orders are being filled within 10 days and 80% have been filled within 20 days over the past twelve months. The percentage fill rate for 20 days for the recent two months is 85%. The number and time for IJ0s waiting materials is shown on Exhibit VI-3, page VI-11. Of primary concern are the IJ0s over 211 days waiting materials. The oldest item on the Back Order Register for Julian Date 4184 was 204 days.

B. Conclusion. There has been an obvious improvement in the support being provided which is reflected in Exhibits VI-1 and VI-2. The order fill rate and number of outstanding orders is at a reasonable level and every effort should continue to be made to maintain this level of support. The validity of the IJ0s waiting material in excess of seven months should be verified. The following questions should be answered.

- Are the IJ0s still valid?
- Has the work been done by some other means?
- What materials are still missing?
- Should the materials have been ordered through supply channels or by BPA?
- Are there substitute materials available?
- Have tracers been sent on the outstanding orders?
- Is the Back Order Register accurate?

C. Recommendations. Management should continue their efforts to maintain the level of support being provided. With the installation of

FESS it will be easier to manage and track the status of the supply support. (FESS is discussed in para. 6.5, below.) The Supply Division should check the Back Order Register against the IJO materials outstanding. The Engineering Resources and Management Division should periodically validate IJOS waiting materials over six months.

#### 6.3 Storage Facilities Condition

A. Finding. During a walkthrough of the supply facilities two negative conditions were noted. The main warehouse is very dirty and strewn with cigarette butts. This was particularly noticeable in the area where administrative paper supplies are kept. "No smoking" signs are prominently displayed. One outside storage shed is in a very poor and unsafe condition. On the positive side it was noted that like materials are stored in their proper location on receipt. The aisles are clear.

B. Conclusion. The "no smoking" requirement should be enforced and the main warehouse swept out and kept clean. The outside storage shed should be demolished before a heavy snow load causes it to collapse and damage the materials stored under it. You have two disasters waiting to happen.

C. Recommendations. Enforce the "no smoking" regulation in the warehouse. Sweep out the warehouse. Develop a schedule to sweep out a specific section each Friday afternoon and schedule it such that each area is done at least monthly. Demolish the storage shed.

#### 6.4 Refrigeration/Kitchen Equipment Supply Support

A. Finding. All materials, except for emergencies, are ordered direct from a central warehouse in Giessen. Only emergency requirements are purchased using local BPA. The sub-warehouse support is not provided to the Refrigeration/Kitchen Equipment Shop. Reorder points are not

calculated on the shop stock. There is no authorized shop stock or standby equipment list for the Refrigeration/Kitchen Equipment Shop. The number and age of unfilled orders as of 22 June 1984 is shown on Exhibit VI-4, page VI-12. The supply function is handled by the acting foreman (shop foreman is Chairman of the Works Council) with assistance from one of the mechanics. As a further distraction all phone calls for the Steamfitting/Plumbing Shop and Electrical Shop are received in this shop.

B. Conclusion. The necessity to continue a separate supply function for this shop (as well as Organization Maintenance) is not understood. The control procedures required to maintain status of this stock are the same. In discussing this situation with the Supply Chief it was agreed that management of stock could be integrated into the current sub-warehouse function. The orders would still go to the central warehouse in Giessen, which is understood to be separate from the V Corps central warehouse. The stock would not have to be moved. The mechanic presently assisting the foreman should be reclassified as a supply clerk, remain in the Refrigeration/Kitchen Equipment Shop, relieve the foreman of the supply management function, and other clerical duties such as answering the phone and maintaining job and time status records. It is not known if this shop and the Organization Maintenance Shop's supply support is going to be integrated into FESS. If the full benefit of FESS is to be gained all supply management functions should be consolidated at the DEH level. Shop Stock list and a Standby Items list should be developed. Reorder points for shop stock should be developed.

C. Recommendations. Integrate the supply management functions into the Supply Division. Establish a Supply Clerk to handle this shop's

requirements and to relieve the shop foreman of other clerical and bookkeeping duties. Perform a periodic review of the item on backorder to determine accuracy/validity -- particularly for the requests over one year old.

#### **6.5 FESS Supply Management Report**

A. Finding. The information contained in the FESS Supply Management Report provides the Supply Division Chief and the Director a wealth of information as to status of support to the workforce.

B. Conclusion. The information presented in this report is invaluable. Through proper use of the data it is possible to track trends in any category to establish seasonal adjustment, determine areas where more attention is needed and to measure improvements. Use of trend line graphs is suggested. Exhibits VI-5A through VI-5H, pages VI-13 through VI-20, are examples as to how the data can be displayed. Use of these graphs will assist the Supply Division Chief in identifying areas that may need investigation. Reviewing raw data over a period of months contained in individual reports is cumbersome and not likely to be done consistently as reviewing a graph that shows status over several months using the examples provided.

The following types of information can be derived from the graphs and analyzed:

- Stock Items have increased by 4.8% from 1 October 1982 to 11 October 1983, Exhibit VI-6A, with a stock excess increases of 11.5%, Exhibit VI-5B. While the graph will not tell you why excesses have far exceeded the stock increase it does indicate a problem which requires attention.
- With the increase in stock by 4.8% there is a decrease in stock zero balance of 17.1%, Exhibit VI-5C, which indicates favorable attention in this area.

- The Fringe Line Items, Exhibit VI-5D, indicates a significant increase (72.3%) which would be a point of concern except in this case the quantity of fringe items are small and should be building up.
- Standby items, Exhibit VI-5E, should be expected to stay reasonably level and with .8% change the indication is they are. The Standby Zero Balance level, Exhibit VI-5F, decreasing 16.9% is worthy of note; however, since they are for emergency use, if the trend was an increase a problem in the supply system would be indicated.
- The final two graphs, Exhibits VI-5G, and VI-5H, Line Items Outstanding and Line Items Due Out both are positive indicators. Request for material (outstanding orders) is being acted on faster in the past year and due outs would indicate more material required by the craftspersons is available in the warehouse than was in October 1982.

C. Recommendation. On installation of the FESS program develop a series of charts to which monthly data can be easily added. Provide updated copies to the Director, Deputy Director and Chief ERMD on a monthly basis.

#### 6.6 Equipment Maintenance

A. Finding. The DEH vehicle availability rate meets the V Corps goal of 95 percent.

An analysis of selected vehicle line numbers (those vehicles generally supporting the mobile blue collar work forces) during the months February through May 1984, revealed that the availability rate was approximately 95 percent (the V Corps goal). See Exhibit VI-6, page VI-21.

DEH vehicle and equipment maintenance and repair is accomplished by the Equipment Maintenance Branch (EMB), the Support Center Roedelheim and by contract.

Roedelheim support has been provided for repairs beyond the capability of the EMW, for equipment classification inspections and for

direct exchange (DX) of components. A review of available Maintenance Requests (DA Form 2407) shows that between 7 Jan 83 and 8 Apr 84, 28 Maintenance Requests were processed, 17 of them for classification inspection. In May 1984, USAEUR authorized Baumholder to perform the classification inspections. The Branch Chief advised HAMM ASSOCIATES that there was a personnel action in the Civilian Personnel Office to hire an inspector, and that classification inspections would commence when the inspector is hired.

Currently, much of the Basic Commercial Equipment (BCE) maintenance is accomplished at nearby Kusel by contract (Basic Ordering Agreements). Hourly contract rates provided by the Branch Chief, are DM 60-70 and DM 50-60 for the Mercedes and Volkswagen contractors, respectively. The shop rate provided by the DEH is \$9.54/hour, or approximately DM 29/hour (DM 2.71/\$1 X \$9.54). Data from EMB log books revealed that between 14 Dec 83 and 26 Jun 84, 37 Volkswagen vehicles were sent to Kusel for maintenance. During the period 9 Dec 1983 through 24 May 84, 15 Mercedes vehicles were sent to Kusel for maintenance. Based on the above data, approximately 9 vehicles per month are going to Kusel for work. The vehicles are transported by either EMD shop personnel or by craftspersons, who will, if little maintenance time is required, wait at Kusel to return the vehicle. It is the intention of the Branch Chief to perform an increasing amount of BCE maintenance and repair at Baumholder.

B. Conclusion. Considering the percentage of overage vehicles, a 95 percent availability rate is commendable.

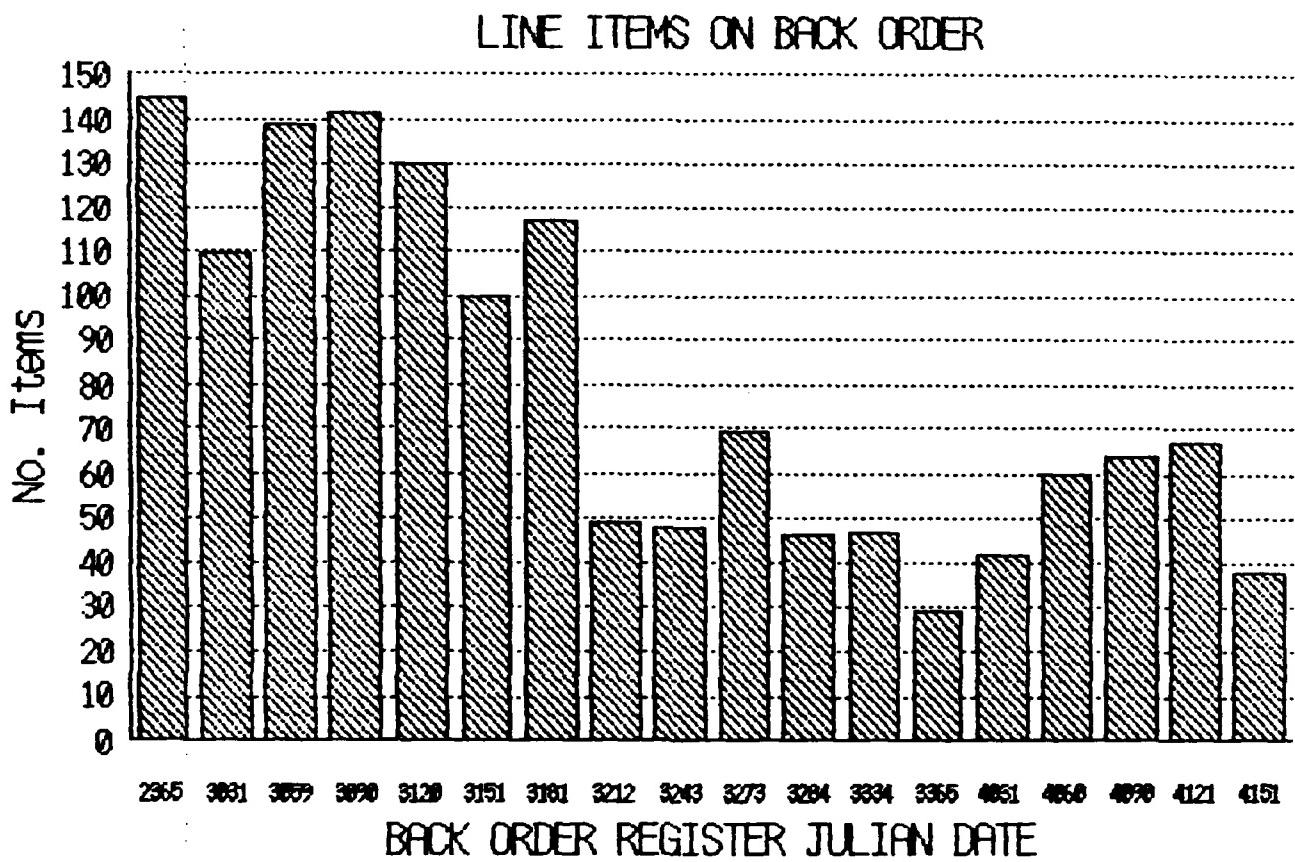
Factors working in favor of maintaining a high vehicle availability rate and reducing costs include:

- Limited use of Support Center Roedelheim. Historically, support maintenance increases vehicle nonavailable time, not only due to increased complexity of repair, but because of the supporting organizations work priorities, which often do not coincide with those of the Military Community.
- Local equipment classification inspection. This again reduces reliance on the support center.
- Increased maintenance of BCE at Baumholder. Incomplete historical data precluded determining an annual cost avoidance if all maintenance work on BCE is accomplished in-house. However, based on a comparison of hourly contract rates and in-house rates, there is an approximately 50 percent cost avoidance when work is accomplished at Baumholder.

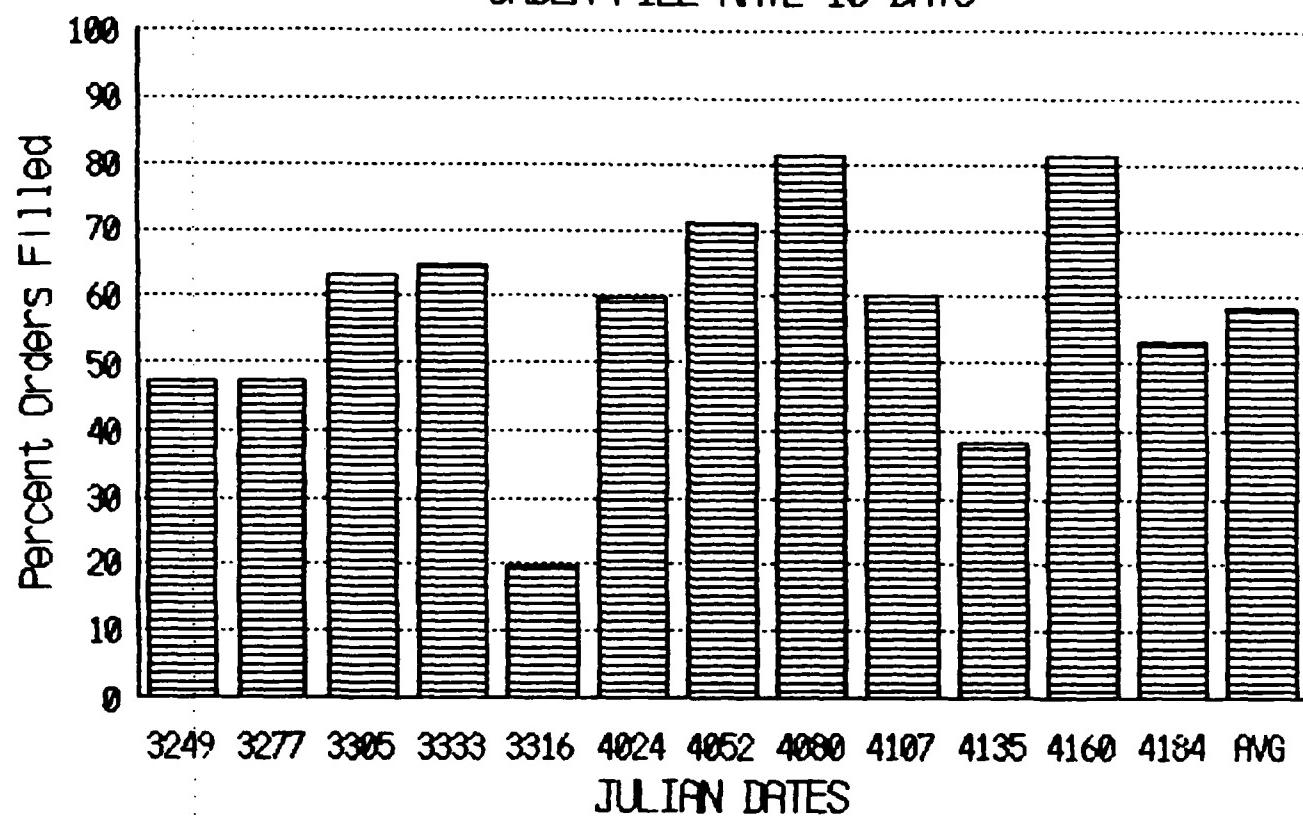
Increasing in-house maintenance avoids another indirect expense. That is the hourly cost of the shop personnel or craftspersons time expended in delivery/waiting/pick-up of equipment. As additional BCE replacements are made available and the number of overage vehicles is reduced, overall maintenance should also decrease.

C. Recommendations. Continue ongoing efforts to accomplish maximum maintenance in-house.

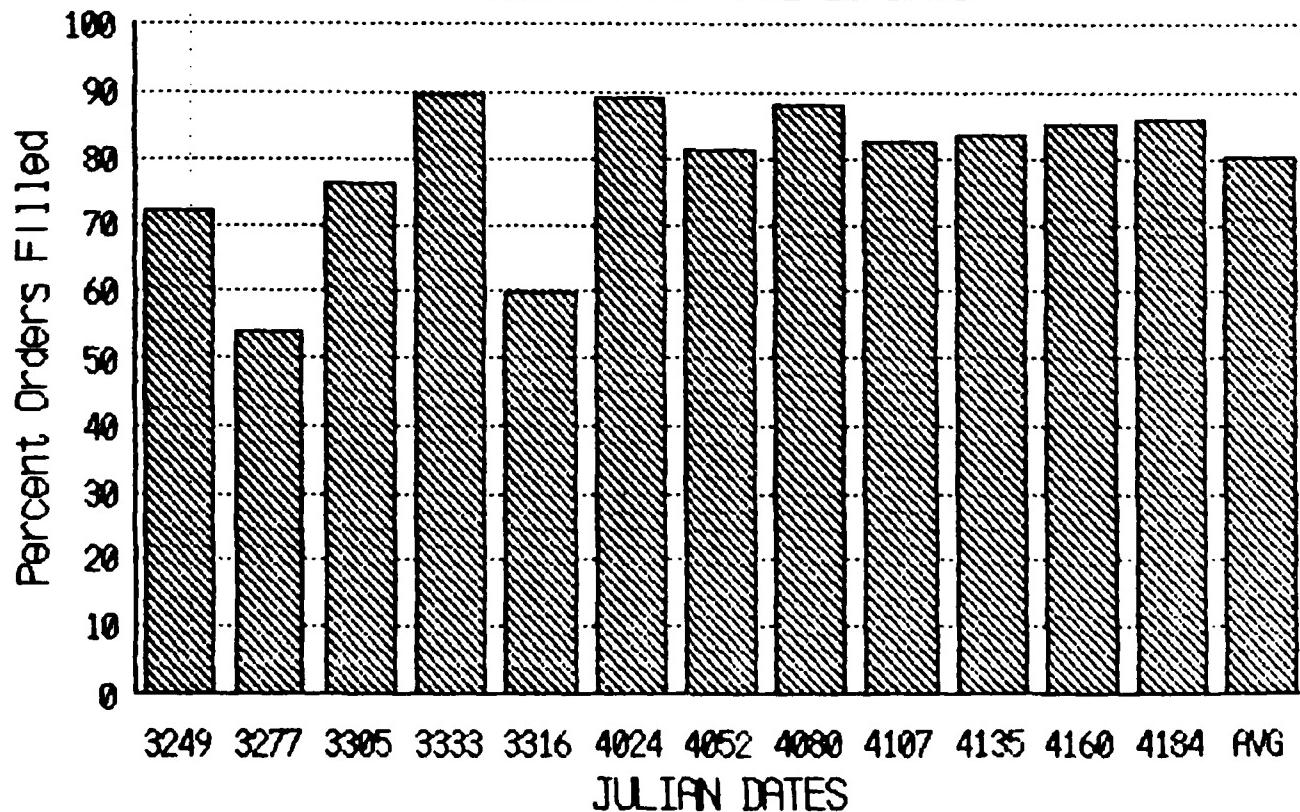
Increasing BCE with its commensurate reduction in overage vehicles should allow the majority of BCE maintenance to be accomplished in-house. Contract maintenance costs should be monitored to ensure realization of this cost avoidance.

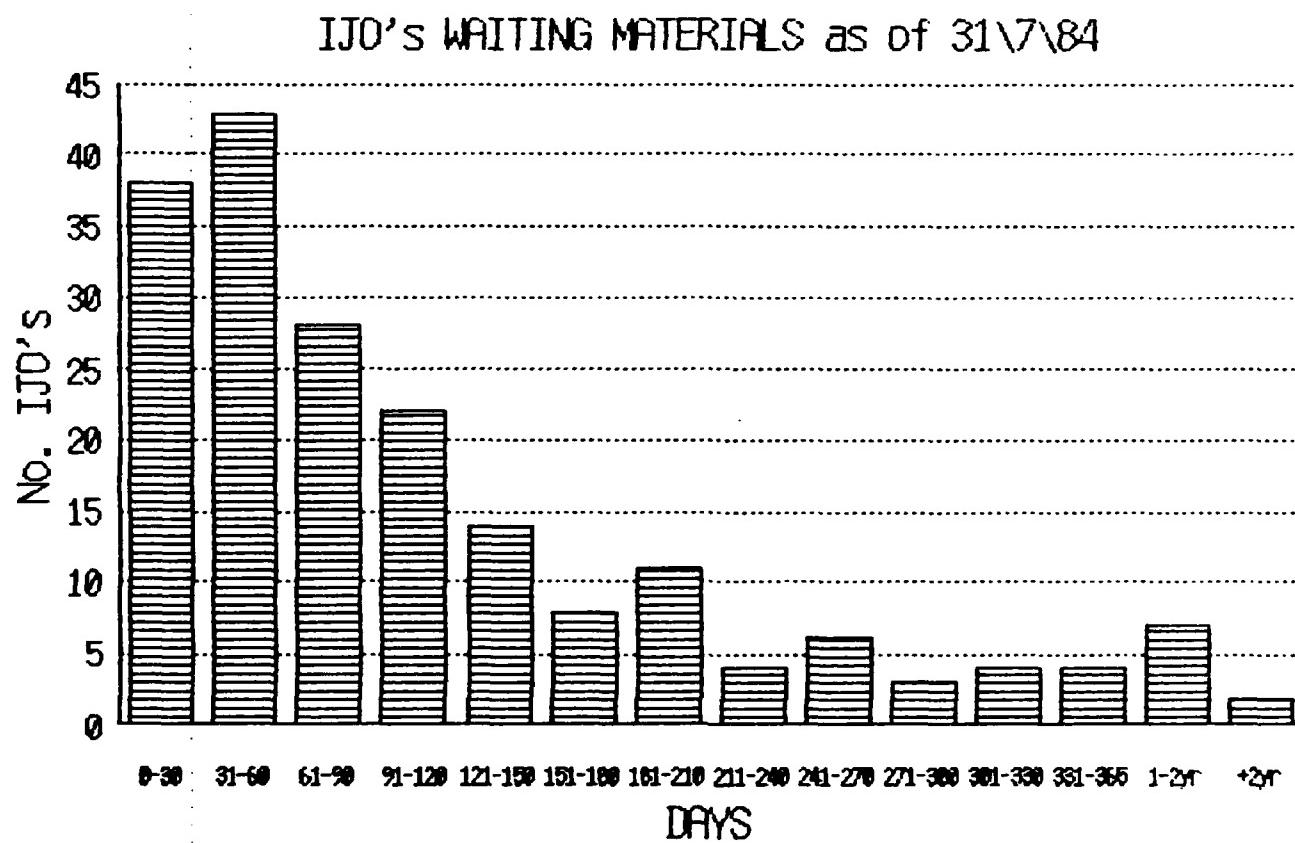


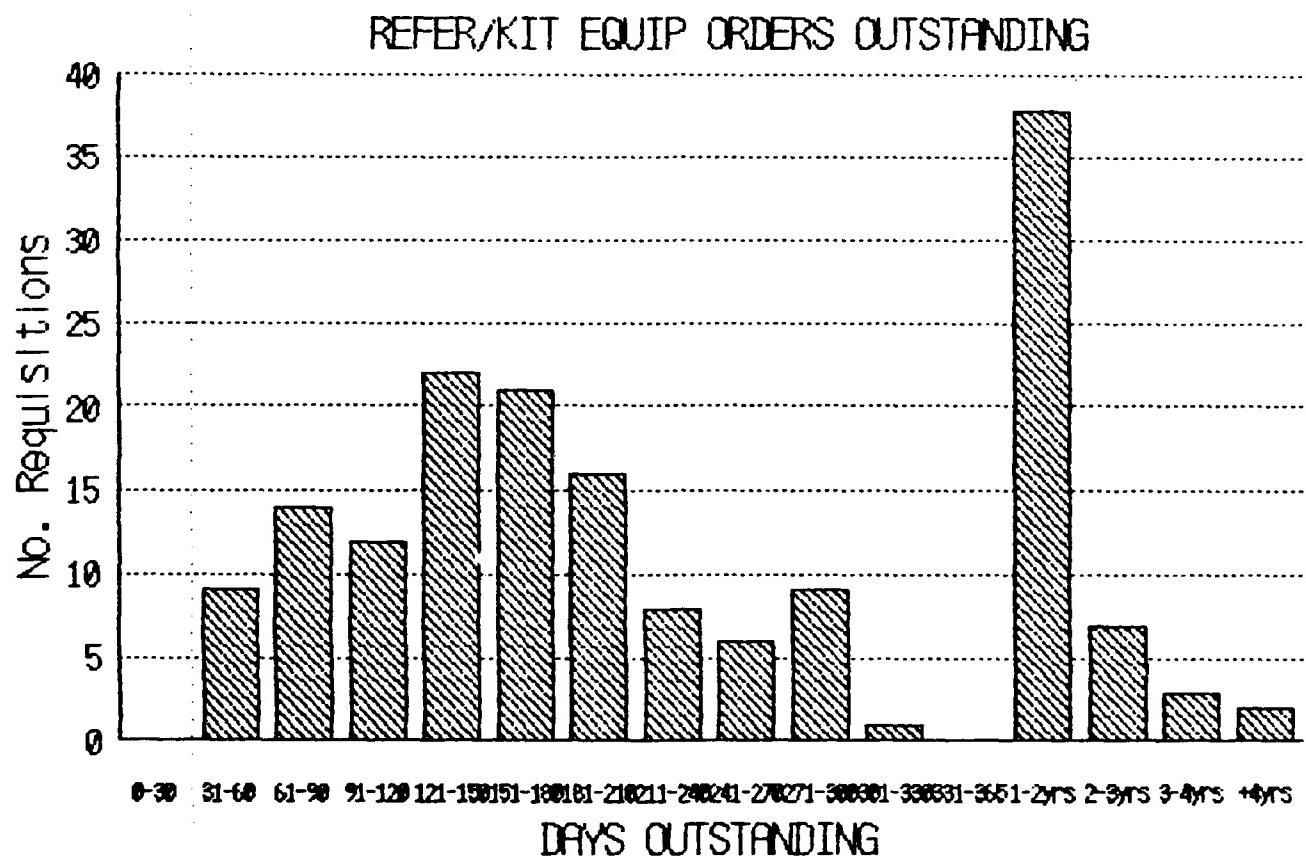
## ORDER FILL RATE 10 DAYS



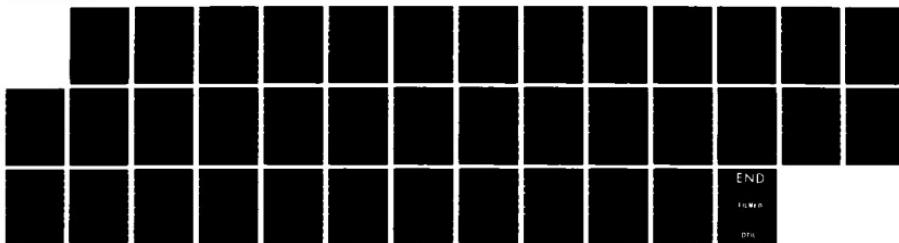
## ORDER FILL RATE 20 DAYS

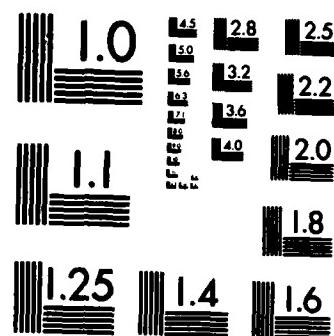






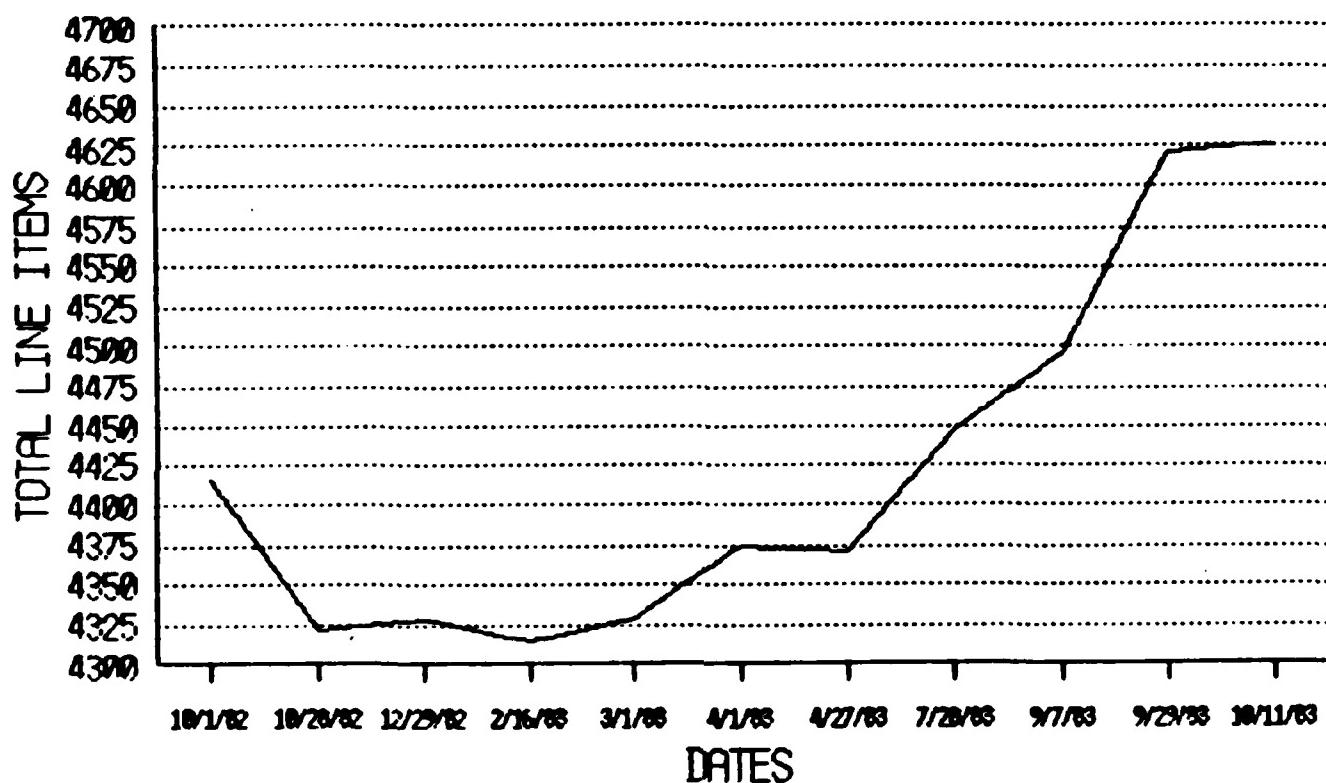
AD-A150 937 PRODUCTIVITY REVIEW AND ANALYSIS OF DIRECTORATE OF  
ENGINEERING AND HOUSIN. (U) HAMM (E L) AND ASSOCIATES  
INC VIRGINIA BEACH VA 30 NOV 84 DACA65-84-C-0111 3/3  
UNCLASSIFIED F/G 5/9 NL



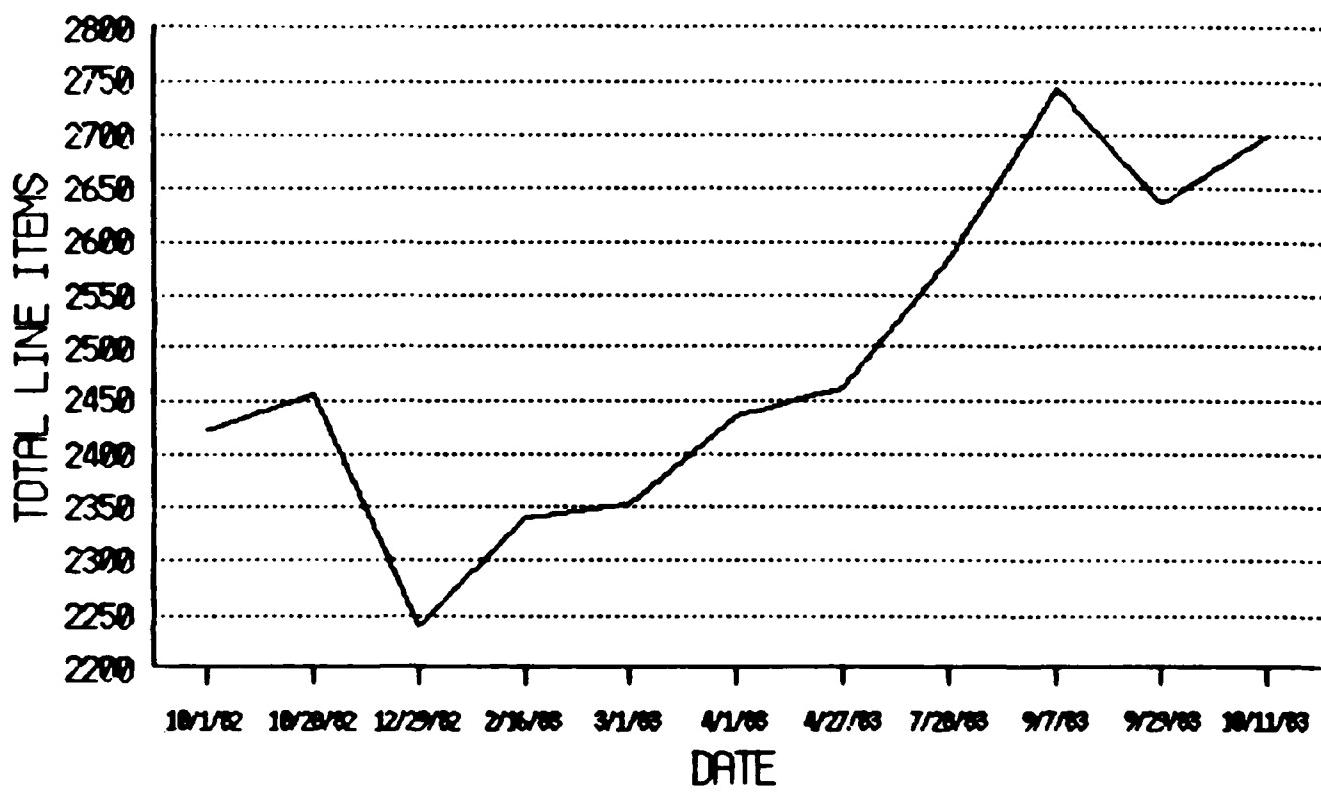


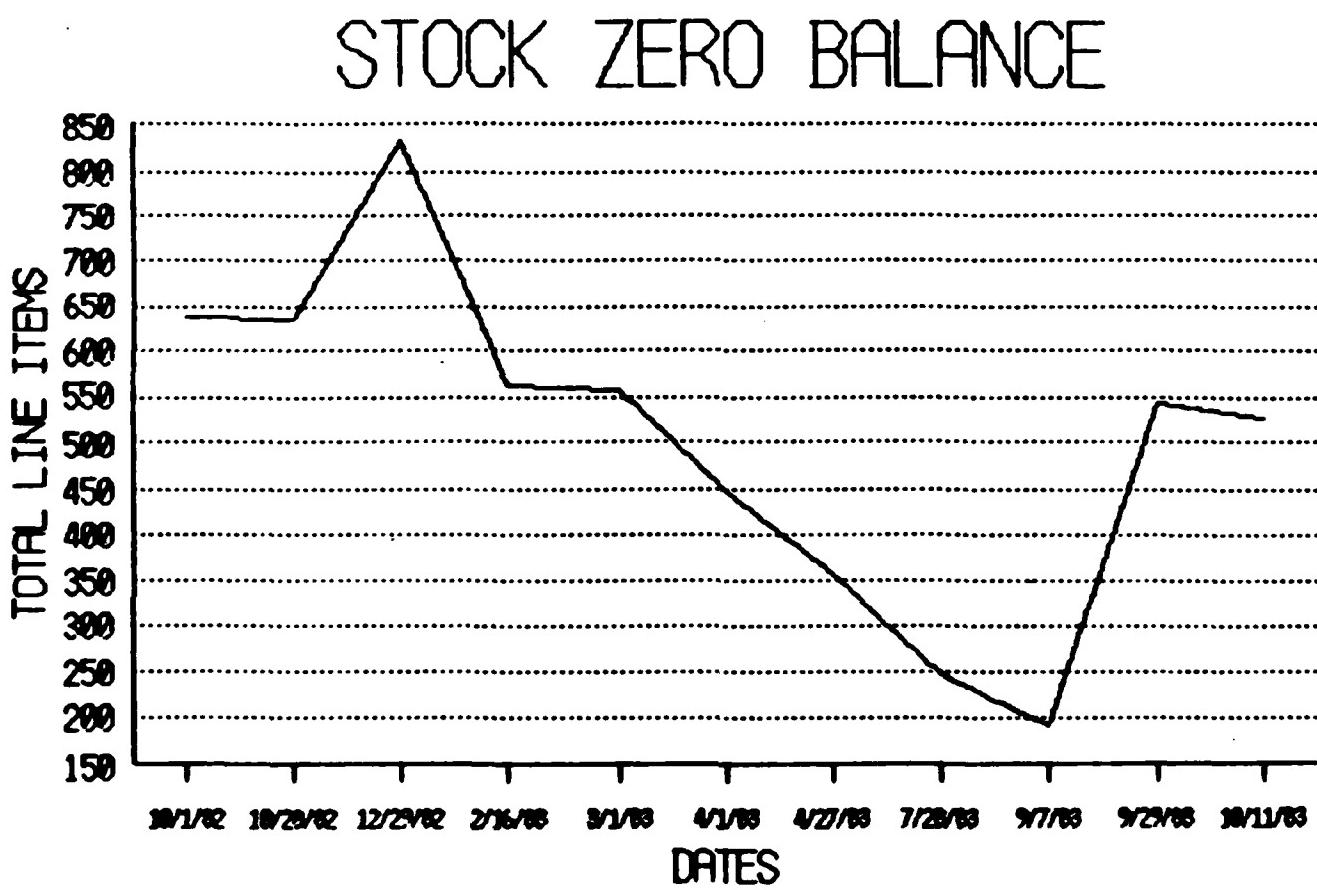
MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

## STOCK ITEMS

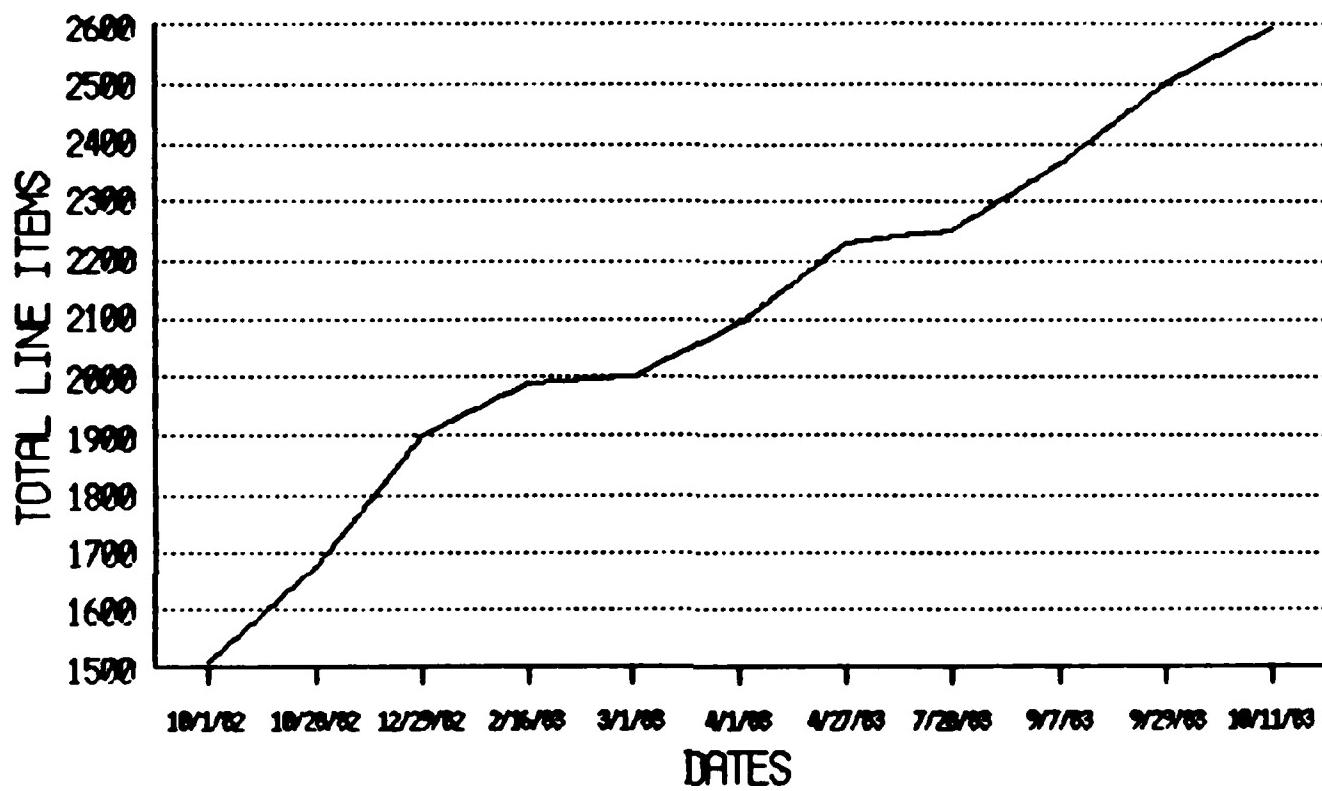


## STOCK EXCESS

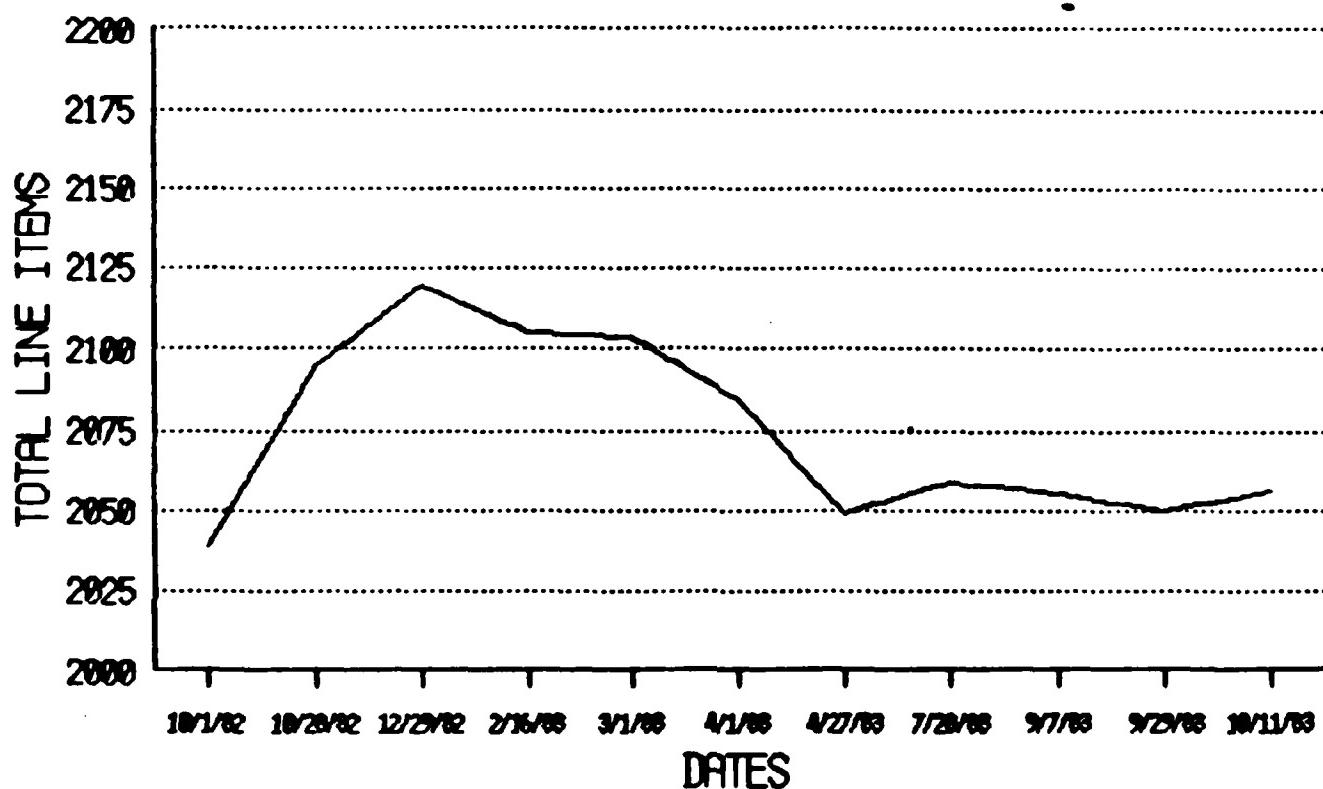




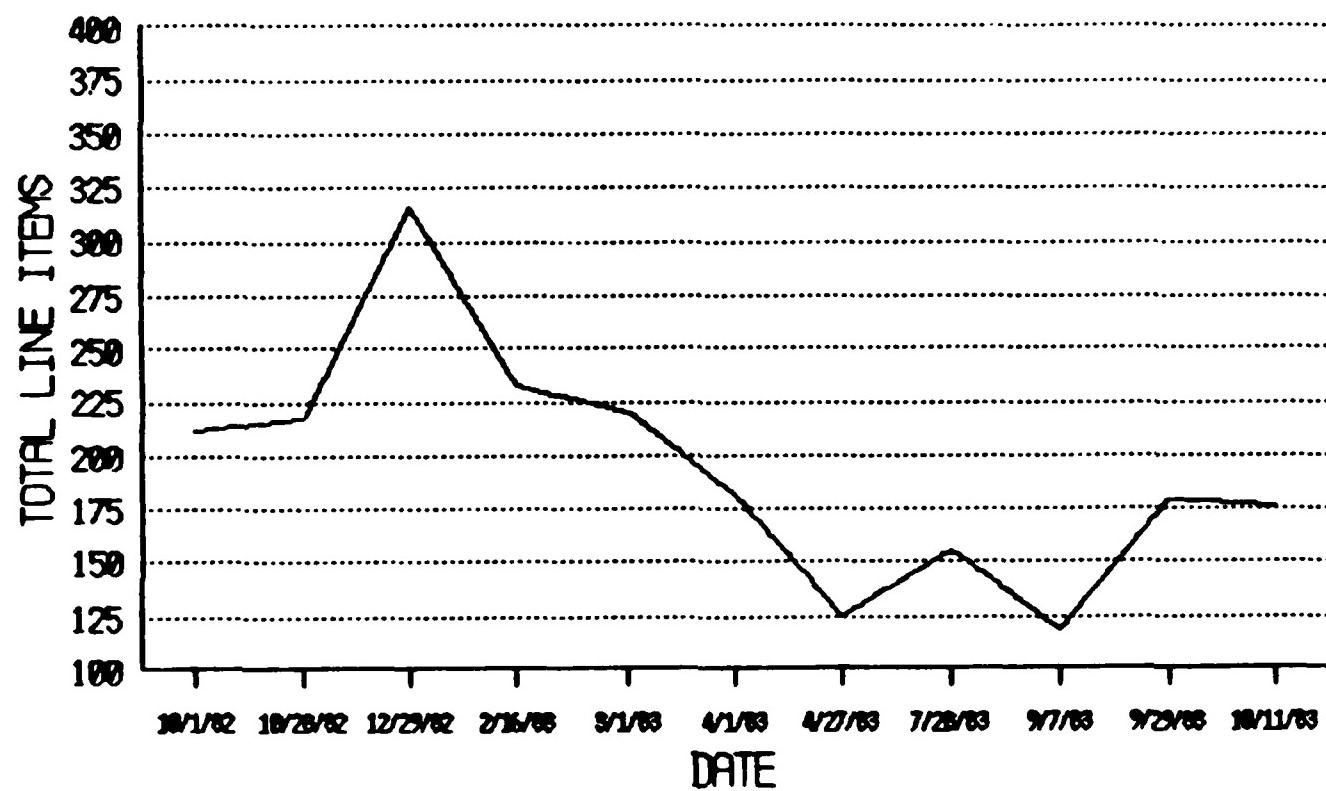
## FRINGE ITEMS



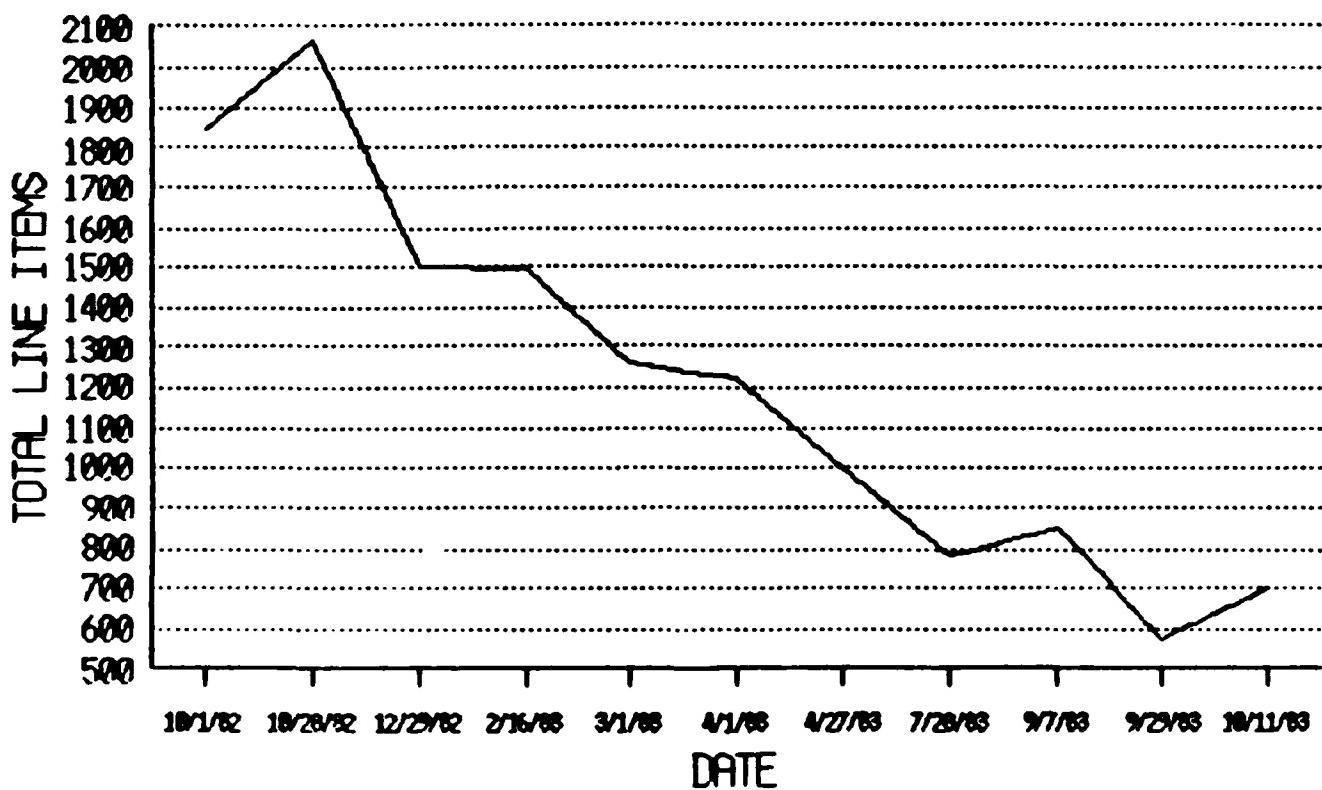
## STANDBY ITEMS



## STANDBY ZERO BALANCE



## OUTSTANDING ORDERS



## DUE OUTS



## EXHIBIT VI-6

VEHICLE AVAILABILITY<sup>1</sup>

<u>Line Number</u>	<u>On Hand Qty</u>	<u>Possible Days</u>	<u>Available Days</u>	<u>Nonavailable Days</u>			
				<u>S<sup>2</sup></u>	<u>Org</u>	<u>M<sup>3</sup></u>	<u>S<sup>2</sup></u>
X-53432	5	605	600			5	
X-53572	26/27	3,206	2,875	82	125		124
X-53848	6	726	711			15	
X-53851	13	1,573	1,486	12	46	29	
X-54200	6	726	716			10	
X-54805	10	1,210	1,203			7	
X-62487	11	1,331	1,306			25	
TOTAL	77/78	9,377	8,897	94	233	29	124

Nonavailable days (Total) 480

% Nonavailable  $480/9,377 = 5.12$ 


---

<sup>1</sup> Data from Material Condition Status Report for months of February through May 1984.

<sup>2</sup> S = Down for Supply

<sup>3</sup> M = Down for Maintenance

SECTION VII  
\* \* \* EMPLOYEE SURVEY \* \* \*

**7.0 INTRODUCTION**

To assist in the review and analysis of the DEH at Baumholder Military Community, an employee survey was distributed to all shop personnel serving the community. This survey is intended to provide additional information to be used in identifying areas affecting productivity, as perceived by the workers.

**7.1 BACKGROUND**

The employee survey was organized into two sections. The first section (questions 1-28) was designed to measure the employees perception of the DEH organization, while the second section (questions 29-37) was designed to elicit their perceptions of specific areas such as logistic support, planning/estimating and tools and equipment.

Respondents were identified by specific organizational elements (i.e., shops). Responses, by shop, are presented in the attached exhibits. (The label Miscellaneous represents those respondents who neglected to indicate their shop.) Comparisons of respondents by shop may be made; however, the results are presented as a general overview of DEH.

**7.2 QUESTIONNAIRE, PART I**

The twenty-eight questions included in the first section were divided into seven categories. These categories were designed to record employee perceptions of the following organizational elements:

<u>Question</u>	<u>Category</u>
1-3	Organizational Communication - the way information is disseminated which assists getting the job done in the best way possible.

- 4-6      Organizational Climate - the perceived properties within the work environment which influence employee behavior.
- 7-9      Organizational Policies and Procedures - the administrative aspects of the organization which enhance productivity.
- 10-14     Supervisory Effectiveness - the perception of the effectiveness of direct supervision on the productive effort.
- 15-19     Team Work - the manner in which employees view the work group as a coordinated team working together.
- 20-24     Internal (Work Group) Communications - the degree in which employees share information on job related events.
- 25-28     Worker Satisfaction - overall worker perception of how well their individual needs are being met.

The responses to part one of the employee survey have been collected and presented in separate exhibits. Exhibit VII-1, page VII-7, presents the questions, by category, and the resultant response percentages. As illustrated, each question had five possible ratings. (Very Little to Very Great). In addition to these five ratings, a column representing those respondents who chose not to answer a particular question is included. The percentages given represent responses for the total DEH workforce.

The ratings for each shop are identified according to the appropriate category in the graphs for Exhibits VII-2A through VII-2G, beginning on page VII-9. Here, responses for each shop were used to calculate a weighted average rating.<sup>1</sup> This rating is then compared to the total DEH average and to all other reporting shops to identify

<sup>1</sup> All questions were answered on a five point Likert Scale. Each "very little extent" answer received one point, each "little extent" answer received two points, etc. A "no response" in a category received zero points and was excluded for calculation purposes. The weighted-average rating is the sum of points for the category, divided by the total number of responses in that category.

perception differences. Finally, a comparison of ratings for each category is presented in Exhibit VII-3, page VII-16. The exhibit shows the total DEH average for each of the seven categories.

#### 7.3 QUESTION, PART II

The nine questions in the second section were added to the survey to provide management with information on areas specific to operations at Baumholder. No attempt has been made to analyze this data. The results shown in Exhibit VII-4, page VII-17, are a percentage spread of the replies received and are provided for informational purposes only.

#### 7.4 EMPLOYEE QUESTIONNAIRE

Exhibit VII-5, beginning on page VII-19, is a copy of the DEH Employee Questionnaire as amended by the USMCA Baumholder.

#### 7.5 SUMMARY

A survey of attitudes and perceptions provides results which may be used to identify possible areas of concern. The results provide a one-time "snapshot" of the organization and, therefore, cannot be used as solid evidence that deficiencies exist. It is important that assumptions about differences in answers not be made, but this information should be used as a vehicle to initiate a dialogue with those elements of the organization which indicate less positive perceptions.

#### 7.6 Findings of Fact

A. In total, the average weighted rating of 4.07 for questions 1-28 indicate very positive feelings about the seven categories outlined above.

B. For Organizational Communications, a rating score of 3.98 indicates a large amount of interaction between management and workers

concerning information. Several shops, however, did report communications effect at some to little extent. The dispersion, by shop, was quite high.

C. While workers have a strong perception of the Organizational Climate with a rating of 3.87, over 50% of the respondents do not consider that people who work hard receive appropriate recognition.

D. Respondents tend to be less positive about Organizational Policies and Procedures with a total rating of 3.31. Over 70% of the respondents consider that very little, little or only some consideration for workers' workload and time is taken into account when work group assignments were planned. Only 30% of the respondents consider that people at higher levels of the organization are greatly or very greatly aware of the problems at their level.

E. Workers' perceptions of Supervisory Effectiveness were very high with a total rating of 4.19. Over seventy percent of the workers rated supervisors at great or very great all of the time.

F. Again, workers showed high perceptions of their work group as a coordinated team working together with a total rating of 4.20. Workers rated Team Work at great or very great for seventy percent of the time in all cases.

G. While workers generally rated Internal Communications at high levels, it was shown that there is apparently little nonsupervisory influence on the work group. Respondents had a total rating of 4.02 for this category.

H. Worker satisfaction obtained a near perfect rating of 4.61. Small amounts of dissatisfaction were noted, primarily with the DEH

organization. Over 90% of the workers responded to great/very great satisfaction in all category questions.

With any rating system, such as the employee survey administered at Baumholder, there are demonstrated tendencies for respondents to answer all questions similarly, regardless of the true feeling. In this situation, such tendencies were present. One shop, for example, had the lowest shop rating in four out of the seven categories. Another shop had the highest shop rating in five out of seven categories. While such occurrences reduce the reliability of the ratings, very valuable information may still be discernable.

#### 7.7 Conclusion

As previously stated, valid conclusions cannot be drawn without supporting corroborating information. The findings of fact identified above indicate those areas within the organization which may benefit from open discussions of perceived problems.

In spite of modern technology in computers and management information systems, the human element is still the most vital and complex factor in any operation or service. The manager's function is to plan, direct, control, monitor and motivate subordinate individuals to maximize production. However, reaction to the way in which managers plan, direct, control, monitor and motivate is based on perception, and not necessarily on fact. A sense of individual worth and organizational recognition is the basic motivator for most individuals. It is management's responsibility to provide this type of motivating environment.

## **7.8 Recommendations**

In light of the findings of fact and conclusion presented above, the following recommendations are presented:

A. Peruse the survey results and identify specific segments of the organization with which to open discussions.

B. Convene a meeting with these personnel and ask what aspects of the organization they were thinking about when answering the survey questions.

C. Ask for suggestions on how to reduce or eliminate perceived roadblocks to efficient operation.

D. Listen to suggestions, record them and, if an immediate answer/decision is not possible, specify a date by which an answer/decision will be provided.

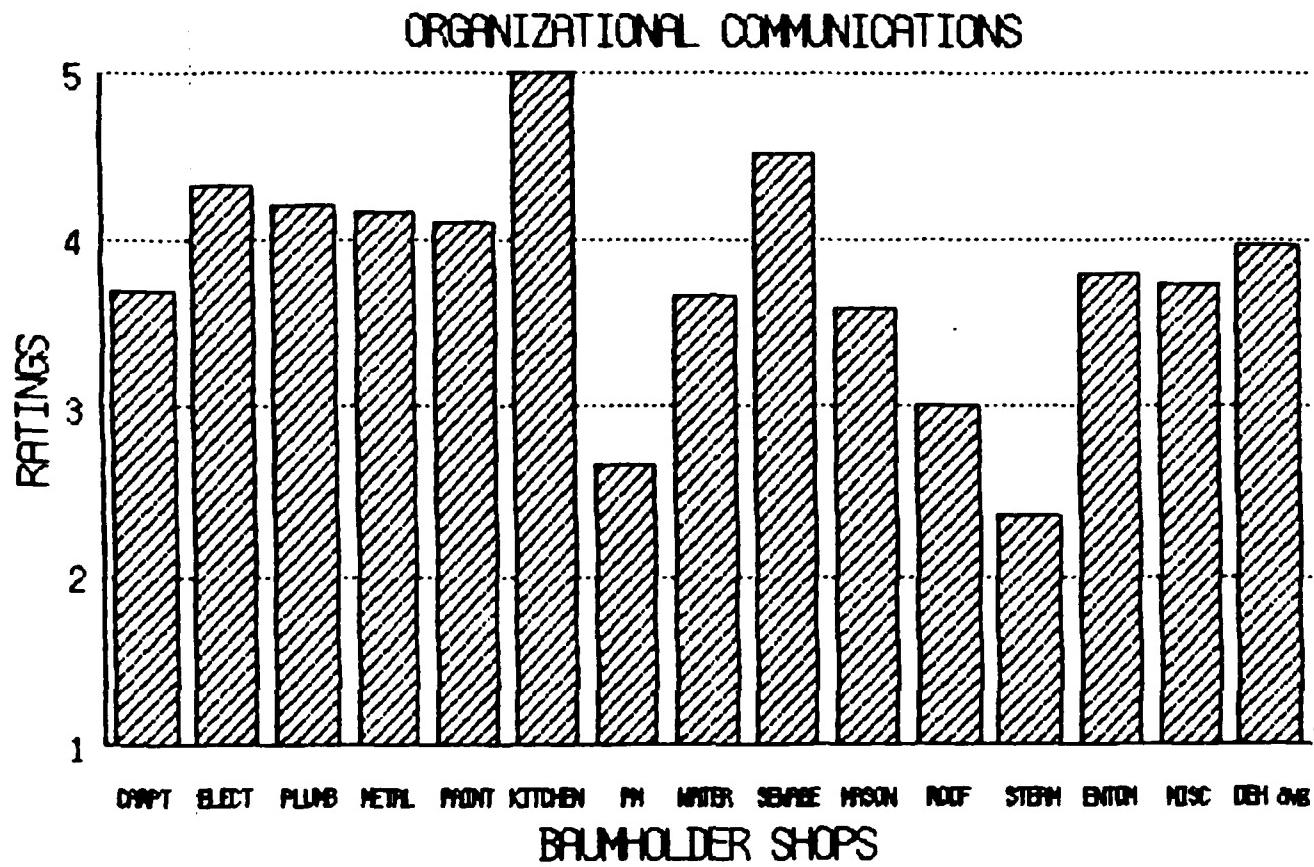
E. Institute a policy for visiting all shops on a periodic basis to share ideas and problems.

F. Assemble all employees annually (an Organization Day) for an address by the DEH and Base Commander. Use this occasion to recognize superior employee performance.

**BAMBOODER MILITARY COMMUNITY  
SURVEY QUESTIONS, SUBCATEGORIES, AND RESPONSE PERCENTAGES  
Questions 1-28**

	<u>PERCENTAGES</u>				
	1. NO RESPONSE	2. SOME	3. GREAT	4. LITTLE	5. VERY LITTLE
<b>ORGANIZATIONAL COMMUNICATIONS</b>					
1. To what extent is the amount of information you get from your supervisor adequate to meet your daily job assignment?	0.9	4.6	13.9	20.7	48.2
2. How receptive are those above you to your ideas and suggestions?	2.8	13.9	20.4	21.3	38.8
3. To what extent are you asked for ideas when decisions are being made that will affect you?	1.9	15.7	15.7	22.2	41.7
<b>ORGANIZATIONAL CLIMATE</b>					
4. To what extent do you feel motivated to contribute your best efforts to the organization's mission and tasks?	0.9	1.9	1.9	17.6	73.1
5. To what extent are there things about this organization (people, policies, or conditions) that encourage you to work hard?	1.9	12.0	18.5	31.5	32.4
6. To what extent do people who work hard receive recognition (e.g. incentive awards)?	17.6	18.5	18.5	18.5	23.2
<b>ORGANIZATIONAL POLICIES AND PROCEDURES</b>					
7. To what extent are work activities sensibly organized in your shop?	0.0	9.3	22.2	25.9	37.0
8. To what extent is the workload and time available taken into consideration in planning your work group assignments?	3.7	29.6	39.8	10.2	13.0
9. People at higher levels of the organization are aware of the problems at your level.	13.0	23.1	28.7	14.8	16.7
<b>SUPERVISORY EFFECTIVENESS</b>					
10. To what extent does your supervisor encourage the members of your work group to work as a team?	0.9	2.8	13.0	31.5	48.1
11. To what extent does your supervisor encourage the members of your work group to give their best effort?	2.8	2.8	9.3	26.9	54.5
12. To what extent does your supervisor expect high standards of performance from the members of your work group?	0.0	2.8	13.9	27.8	50.9
13. To what extent does your supervisor help you plan, organize and schedule your work ahead of time?	0.9	11.1	20.4	26.9	37.9
14. To what extent does your supervisor offer you ideas to help solve job-related problems?	0.0	10.2	15.7	26.9	44.4

	PERCENTAGES					
	TEAM WORK	INTERNAL (WORK GROUP) COMMUNICATIONS	WORKER SATISFACTION	NO RESPONSE	0.0	1.7
	15.	16.	17.	18.	19.	20.
15.	To what extent do members of your work group exchange opinions and ideas?	4.3	15.5	27.2	46.0	3.3
16.	How much do members of your work group encourage each other to work as a team?	2.8	15.7	29.6	46.4	4.6
17.	To what extent do members of your work group maintain high standards of performance?	2.8	17.6	22.2	50.9	2.8
18.	To what extent do members of your work group offer each other ideas for solving job-related problems?	0.9	5.6	20.4	33.3	36.1
19.	To what extent does your work group plan together and coordinate its efforts?	1.9	2.8	10.2	20.4	64.7
20.	To what extent do you have confidence and trust in the members of your work group?	2.8	3.7	16.7	20.4	55.5
21.	To what extent is information about important job related events widely exchanged within your work group?	0.0	1.9	11.1	33.3	52.8
22.	To what extent does your work group make good decisions and solve problems effectively?	0.0	6.5	10.2	26.9	55.5
23.	To what extent has your work group been adequately trained to handle emergency situations?	6.5	9.3	19.4	27.8	31.5
24.	To what extent do nonsupervisory personnel influence what goes on in your work group?	4.6	19.4	27.9	23.1	4.6
25.	All in all, how satisfied are you with the people in your work group?	0.9	1.4	2.3	26.6	68.3
26.	All in all, how satisfied are you with your supervisor?	0.9	0.0	2.8	23.1	71.3
27.	All in all, how satisfied are you with this organization?	0.9	3.7	1.9	37.0	56.5
28.	All in all, how satisfied are you with your job?	0.9	0.9	1.9	18.5	77.8

RATINGS - QUESTIONS 1-24

- 1 - Very little extent
- 2 - Little extent
- 3 - Some extent
- 4 - Great extent
- 5 - Very great extent

SHOPS

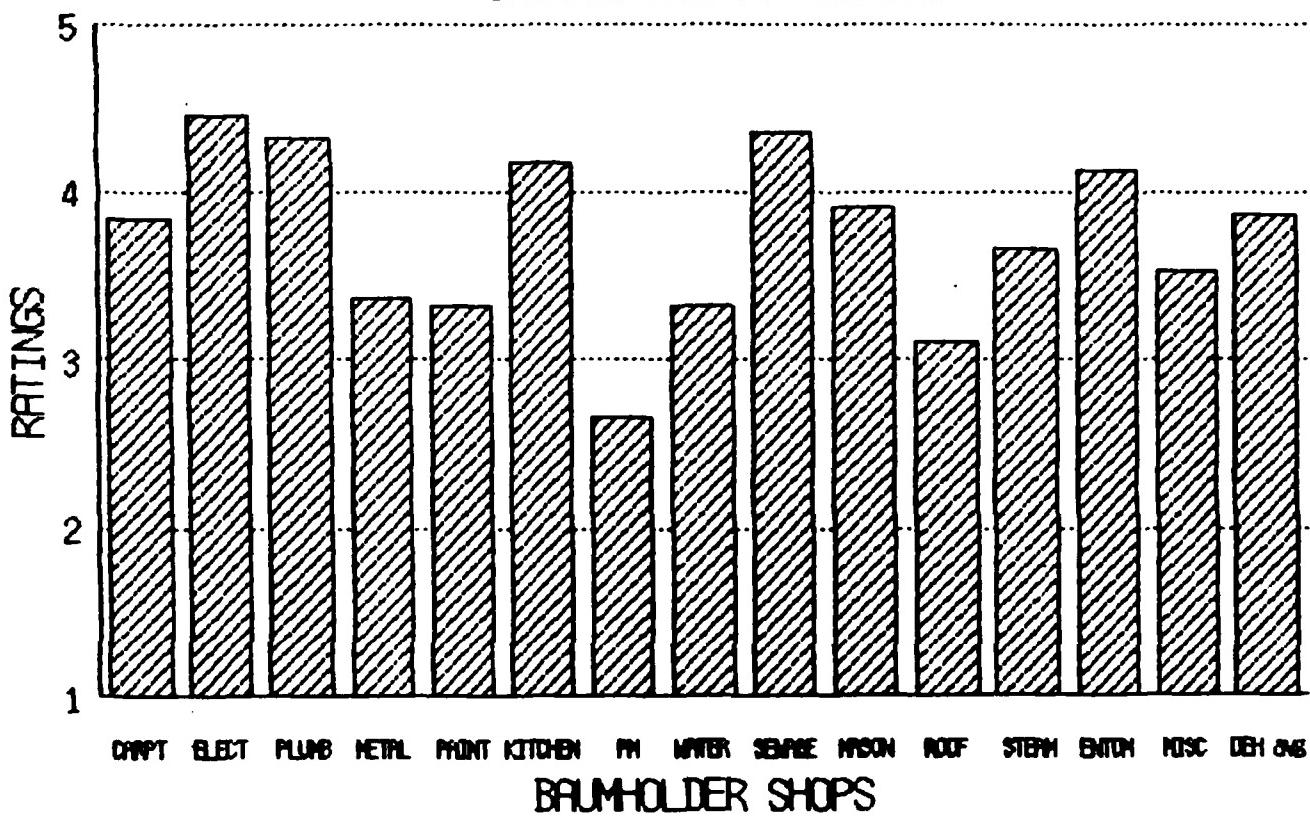
- 01 Carpentry
- 02 Electrical
- 03 Plumbing
- 04 Sheetmetal
- 05 Paint
- 06 Refrigeration/AC/Kitchen
- 10 Preventive Maintenance
- 13 Water Treatment

RATINGS - QUESTIONS 25-28

- 1 - Very dissatisfied
- 2 - Somewhat dissatisfied
- 3 - Neither satisfied nor dissatisfied
- 4 - Fairly satisfied
- 5 - Very satisfied

- 14 Sewage Treatment
- 16 Masonry
- 17 Roofing
- 19 Steamfitting
- 21 Entomology
- MISC Miscellaneous Shops
- DEH avg DEH Average

## ORGANIZATIONAL CLIMATE

RATINGS - QUESTIONS 1-24

- 1 - Very little extent
- 2 - Little extent
- 3 - Some extent
- 4 - Great extent
- 5 - Very great extent

SHOPS

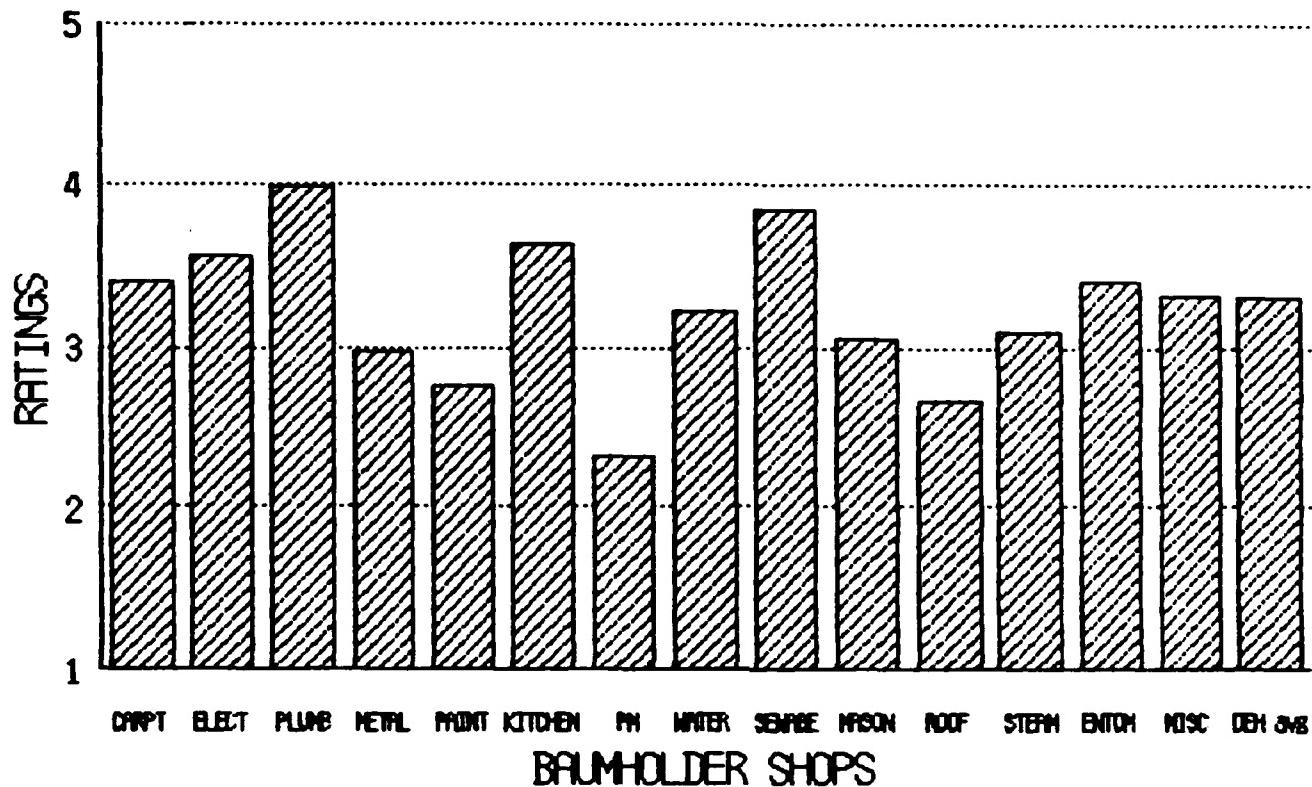
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- 21 Entomology
- MISC Miscellaneous Shops
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## ORGANIZATIONAL POLICIES &amp; PROCEDURES

RATINGS - QUESTIONS 1-24

- 1 - Very little extent
- 2 - Little extent
- 3 - Some extent
- 4 - Great extent
- 5 - Very great extent

SHOPS

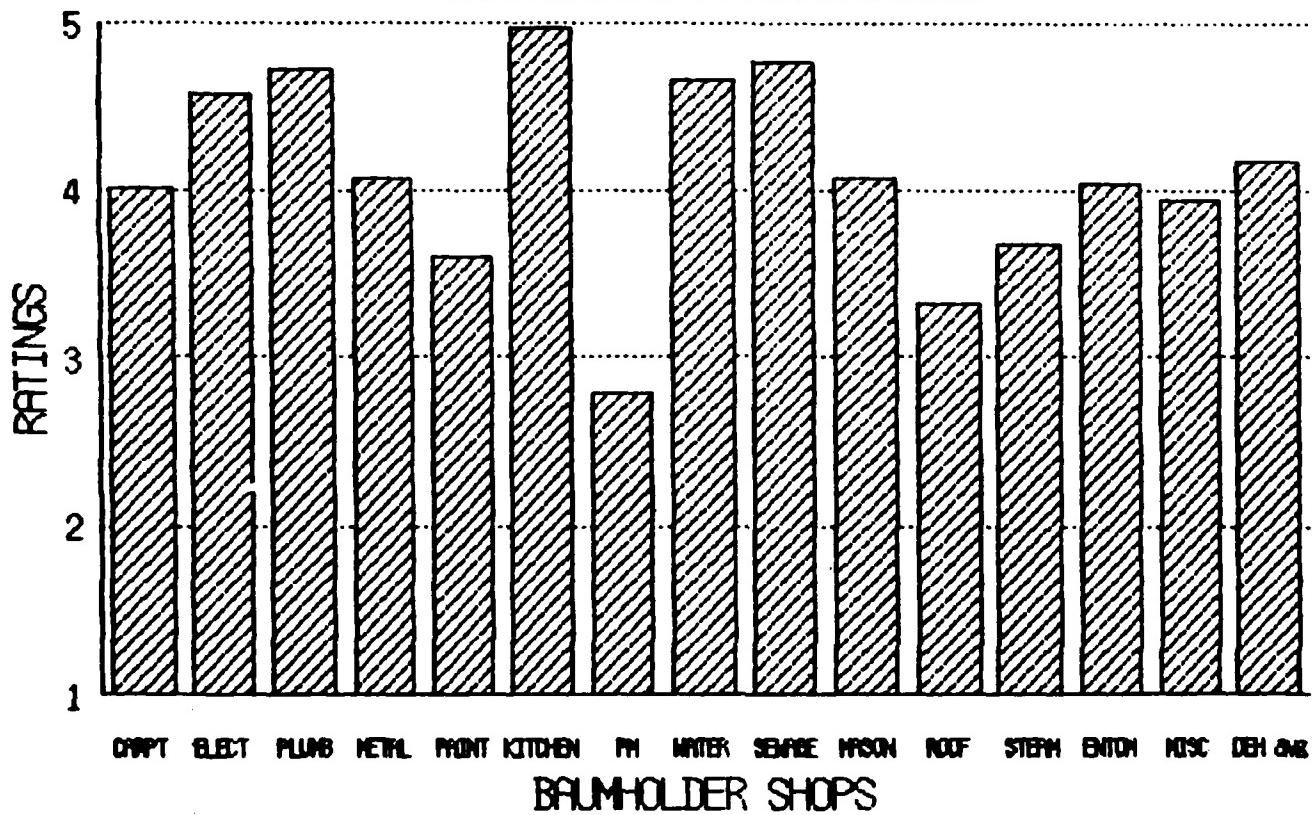
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- MISC Miscellaneous Shops
- DEH avg DEH Average

## SUPERVISORY EFFECTIVENESS

RATINGS - QUESTIONS 1-24

- 1 - Very little extent
- 2 - Little extent
- 3 - Some extent
- 4 - Great extent
- 5 - Very great extent

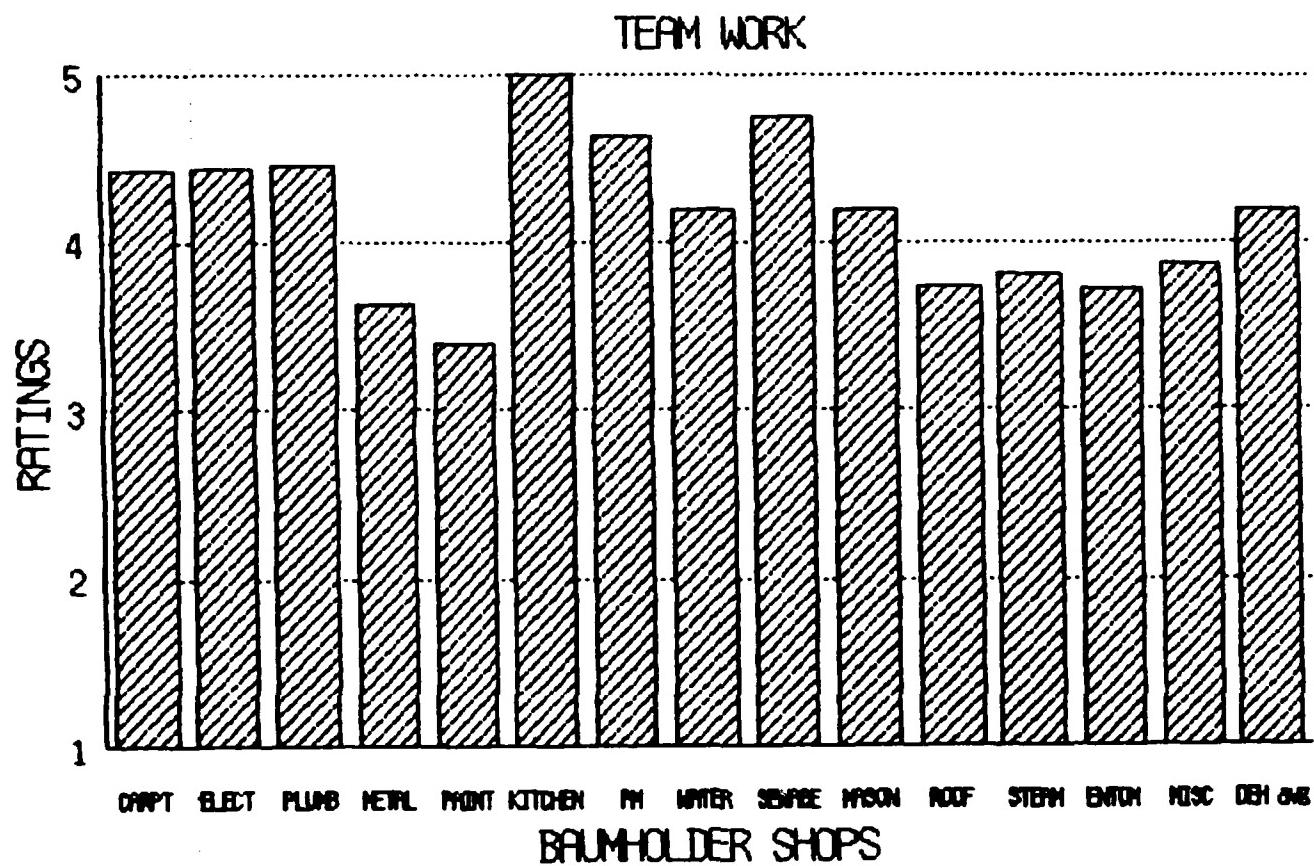
SHOPS

- 01 Carpentry
- 02 Electrical
- 03 Plumbing
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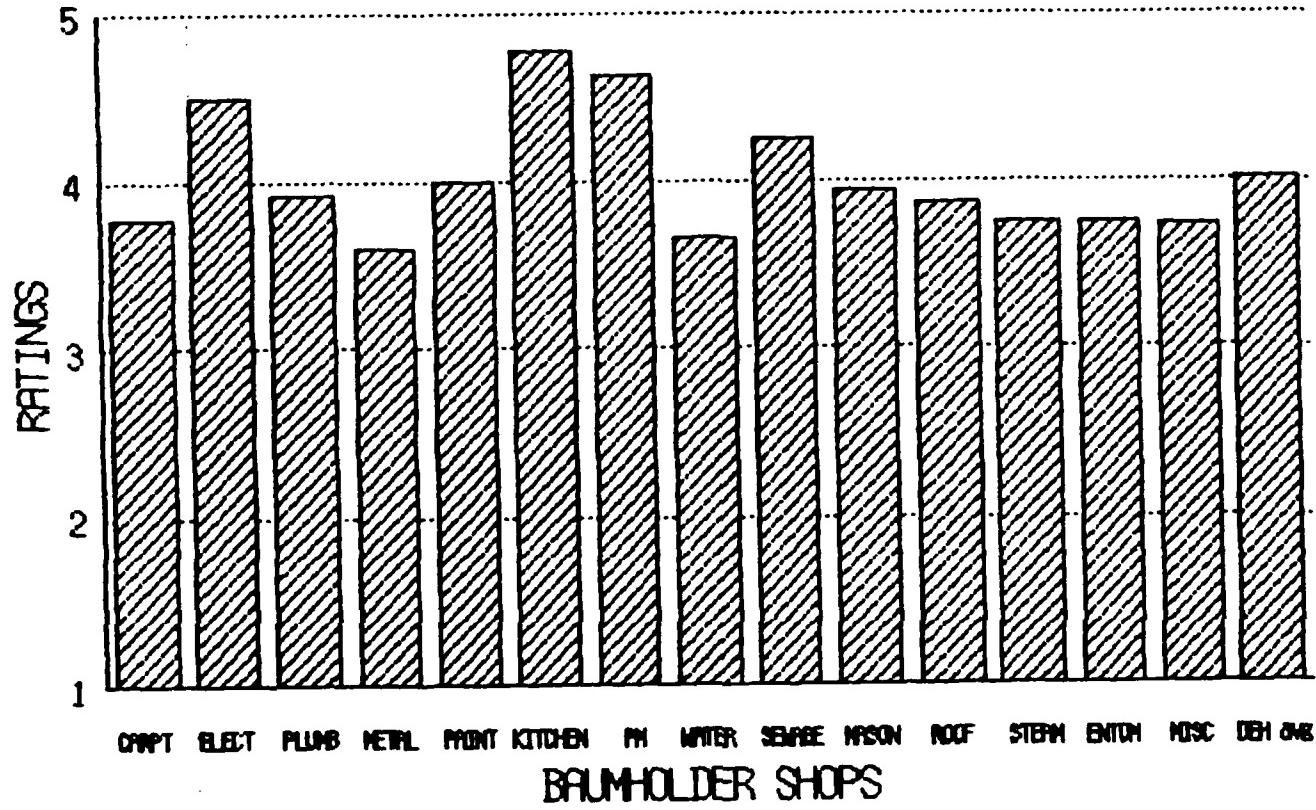
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- 21 Entomology
- MISC Miscellaneous Shops
- DEH avg DEH Average

## INTERNAL COMMUNICATIONS

RATINGS - QUESTIONS 1-24

- 1 - Very little extent
- 2 - Little extent
- 3 - Some extent
- 4 - Great extent
- 5 - Very great extent

SHOPS

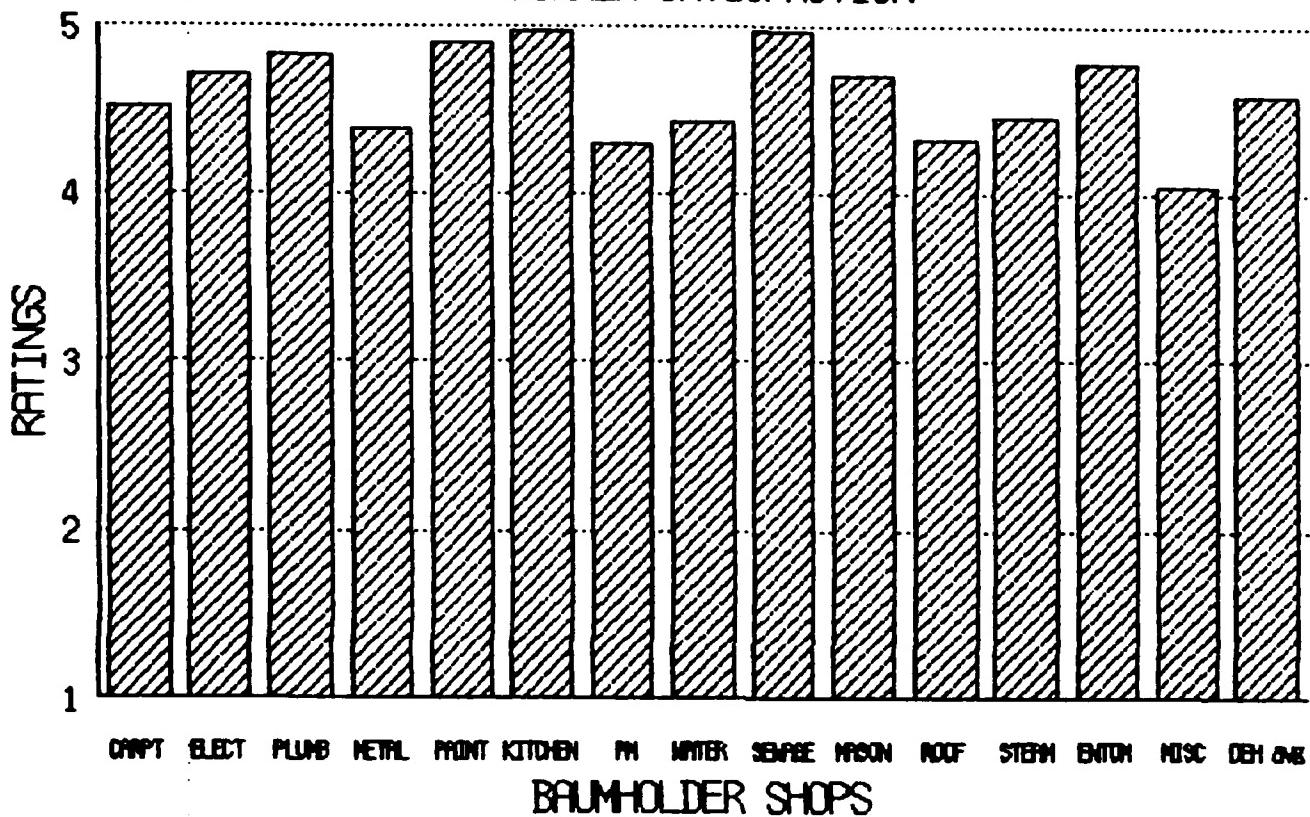
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- 21 Entomology
- MISC Miscellaneous Shops
- DEH avg DEH Average

## WORKER SATISFACTION

RATINGS - QUESTIONS 1-24

- 1 - Very little extent
- 2 - Little extent
- 3 - Some extent
- 4 - Great extent
- 5 - Very great extent

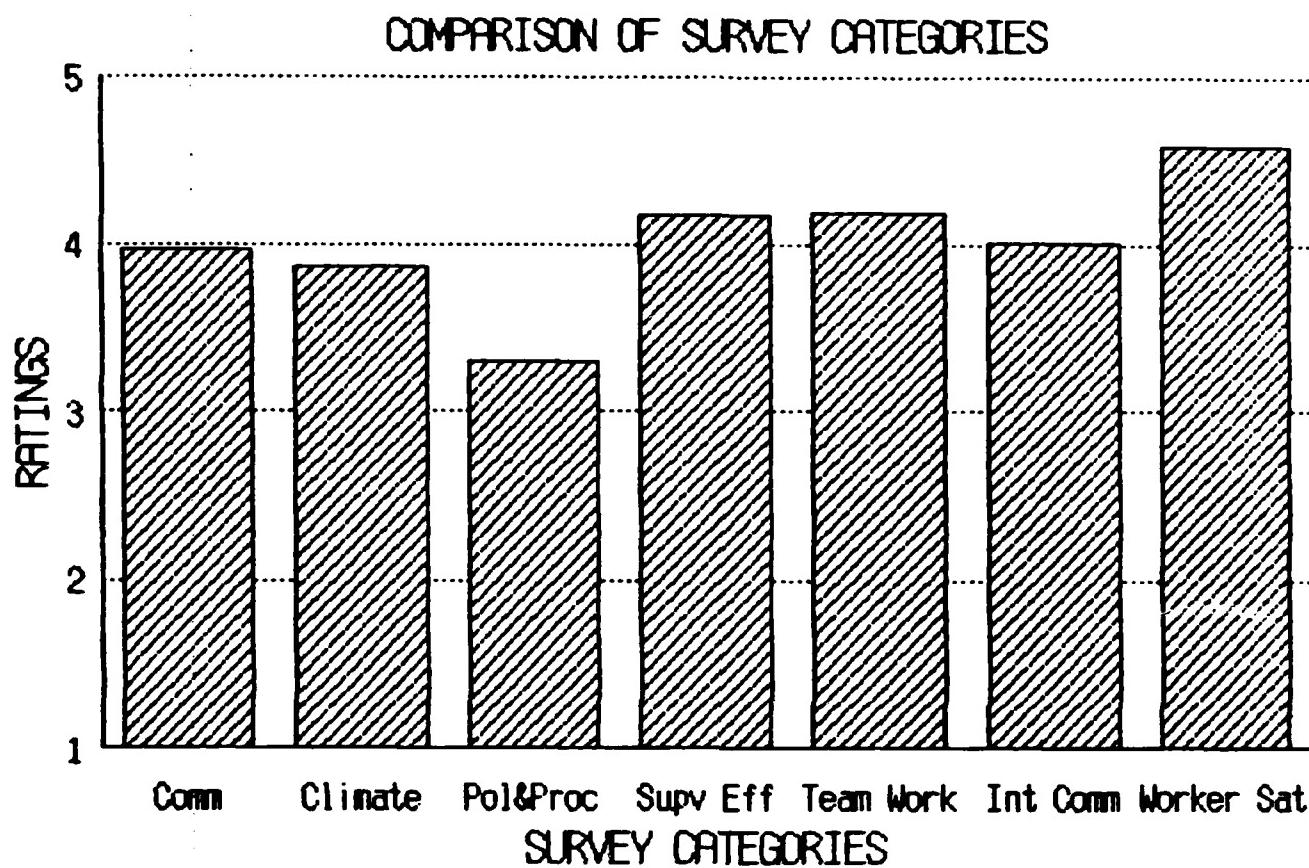
SHOPS

- 01 Carpentry
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RATINGS - QUESTIONS 1-24

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- 5 - Very great extent

RATINGS - QUESTIONS 25-28

- 1 - Very dissatisfied
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- 3 - Neither satisfied nor dissatisfied
- 4 - Fairly satisfied
- 5 - Very satisfied

**BAHAMOOR MILITARY COMMUNITY  
SURVEY RESULTS AND RESPONSE PERCENTAGES  
QUESTIONS 29-37**

	RESPONSE PERCENTAGES									
	DEH Avg.	Missonary	Rel. Unit.	Electrical	Steam Ftg.	Plumbing	Carpentry	Habter Trmt.	A/C/R/Refr.	Seorage
29. In general, do you think the supply support provided is:										
EXCELLENT	9.3	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GOOD	50.9	56.3	37.5	100.0	100.0	33.3	88.9	28.6	33.4	33.3
FAIR	18.5	6.2	25.0	0.0	0.0	66.7	11.1	28.5	33.3	66.7
POOR	17.6	25.0	37.5	0.0	0.0	0.0	0.0	42.9	33.3	0.0
VERY POOR	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1
ND RESPONSE	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.3
30. In general, do you feel the planning and estimating for your assignments are:										
UNDERSTATED	11.1	25.0	25.0	0.0	0.0	0.0	0.0	21.4	0.0	0.0
OVERTATED	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARE ACCURATE	70.4	43.8	75.0	100.0	100.0	25.0	33.3	64.3	100.0	66.7
I DON'T KNOW	12.0	31.2	0.0	0.0	0.0	66.7	0.0	14.3	0.0	11.1
NO RESPONSE	6.5	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	33.3
31. Are vehicle assignments adequate for your shop?										
YES	50.0	56.2	37.5	100.0	100.0	100.0	33.3	22.2	35.7	33.4
NO	47.2	43.8	62.5	0.0	100.0	0.0	66.7	77.8	64.3	33.3
I DON'T KNOW	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.7
NO RESPONSE/NOT APPLY	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32. The equipment and tools provided by the Government are:										
EXCELLENT	6.5	12.5	0.0	0.0	75.0	0.0	0.0	0.0	0.0	22.2
SATISFACTORY	57.4	12.5	62.5	66.7	100.0	25.0	33.3	100.0	35.7	100.0
POOR	26.9	50.0	37.5	33.3	0.0	0.0	66.7	0.0	0.0	77.8
UNSATISFACTORY	8.3	25.0	0.0	0.0	0.0	0.0	0.0	28.6	0.0	66.7
NO RESPONSE	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33. For the work you do, do you feel you are:										
PAID FAIRLY	30.6	31.2	25.0	100.0	100.0	0.0	33.3	44.5	14.3	66.7
UNDERPAID	63.0	50.0	75.0	0.0	100.0	100.0	66.7	44.4	7.1	77.8
OVERPAID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DON'T KNOW	5.5	18.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO RESPONSE	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34. When going to pick up material for an IJO, you find the material is:										
ALWAYS THERE	14.8	18.8	0.0	66.7	20.0	0.0	33.3	44.4	7.1	11.1
USUALLY THERE	75.0	62.5	100.0	33.3	80.0	100.0	66.7	55.6	92.9	100.0
NEVER THERE	4.6	18.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NO RESPONSE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

**EXHIBIT VII-4**

RESPONSE PERCENTAGES						
						Miscellaneous
						Service
						A/C/R/Refr.
						Halter Tract.
						Carpentry
						Plumbing
						Steam Ftg.
						Electrical
						Roofing
						Prv. Maint.
						Entomology
						Paint
						Metal
						Masonry
						DEH Avg.
35. Work is interrupted due to nonavailability of material:	OFTEN	6.2	0.0	0.0	0.0	25.0
	HALF THE TIME	25.0	0.0	0.0	0.0	65.7
	SELDOM	50.0	62.5	56.7	20.0	32.3
	NEVER	12.9	18.8	12.5	33.3	66.7
	NO RESPONSE	2.8	0.0	0.0	0.0	0.0
36. In general, do you feel you are:	OVERWORKED	12.5	0.0	0.0	0.0	33.3
	UNDERWORKED	37.5	12.5	0.0	0.0	25.0
	NEITHER	50.0	87.5	0.0	100.0	75.0
	DON'T KNOW	7.4	0.0	0.0	0.0	66.7
	NO RESPONSE	5.6	0.0	0.0	0.0	0.0
37. How often does your foreman visit you at the job site?	ONCE A DAY	37.5	0.0	33.3	20.0	0.0
	MORE THAN ONCE A DAY	49.1	62.5	50.0	66.7	40.0
	ONCE A WEEK	7.4	0.0	0.0	0.0	20.0
	SELDOM	7.4	0.0	50.0	0.0	0.0
	NO RESPONSE	1.9	0.0	0.0	0.0	0.0

Ueberblick fuer DFE Angestellte  
DFE Employee Questionnaire

Allgemeine Information

Demographic Data

Wie lange sind Sie mit DFE beschaeftigt? \_\_\_\_\_  
How long have you been at this command?

Wie lange sind Sie jetzt beschaeftigt bei Ihrer jetzigen  
Arbeitsgruppe?  
How long have you been assigned to your present work group?

Wie viele Dienstjahre sind Sie jetzt mit dem U.S. Government  
beschaeftigt?  
How many years of federal service have you accumulated?

Was ist Ihre jetzige Verdienstklasse?  
What is your current pay grade?

Zu welchem Betrieb oder Werkstatt sind Sie jetzt angewiesen?  
To what shop are you assigned?

Was sind Ihre jetzigen Zukunftsplaene? (Bitte nur eine Antwort ankreuzen)  
What are your current work plans? (Please circle one choice)

- a. Vollendung der Arbeitsjahre (Pension) mit DFE.  
To remain at DFE until retirement.
- b. Arbeitswechsel.  
To seek employment elsewhere.
- c. Unentschlossen mit meinen Arbeitsplaenen.  
Undecided about my work plans.

Anleitung  
(Survey Instructions)

1. Der Wert dieses Fragebogens haengt von Ihren aufrichtigen und gewissen haften Beantwortungen aller Fragen ab. Alle Fragebogen werden vertraulich behandelt.  
The value of this survey depends upon your being straight forward in answering this questionnaire. Your answer sheets will be collated by E. L. Hamm and Associates, and no one from your organization will see them.
2. Beantworten Sie bitte alle Fragen mit einem Kreuz in dem vorgesehenen Karo zu Ihrem besten Wissen.  
All questions can be answered by checking the appropriate space. If you do not find the exact answer that fits your case, select the one that is closest to it.

3. Jede Frage hat fuenf moegliche Antworten. Wählen Sie Ihre Antworten sorgfaeltig.  
Each question has five possible responses. To answer these questions, go through them carefully one at a time and check one answer that best represents your feelings.
  4. Dieses ist keine Pruefung, also gibt es keine richtigen oder falschen Antworten.  
THIS IS NOT A TEST, so there are no right or wrong answers. The best answer is the one which most accurately describes how you feel about each issue.

Beachtung: In den folgenden Fragen, die Arbeitsgruppe bezieht sich auf alle Personen unter Anleitung eines Vorgesetzten oder Aufseher, Organisation bezieht sich auf die ganze DFE.

**NOTE:** In the following questions, WORK GROUP refers to all those persons who report to the same supervisor. ORGANIZATION refers to the entire DFE.

sehr wenig	To a very little extent
eher	To a little extent
etwas mehr	To some extent
viele mehr	To a great extent
sehr viel	To a very great extent

1. In welchem Ausmass erhalten Sie Ihre genauen Arbeitsanweisungen von Ihren Vorsteher oder Meister?  
To what extent is the amount of information you get from your supervisor adequate to meet your daily job assignments?
  2. Kommt man Ihren Ideen und Vorschlaegen entgegen?  
How receptive are those above you to your ideas and suggestions?
  3. Fragt man Sie nach Ihrer Meinung wenn neue Entschluesse und Veraenderungen getroffen werden, das Sie betrifft?  
To what extent are you asked for ideas when decisions are being made that will affect you?
  4. In welchem Ausmass fuehlen Sie sich verpflichtet fuer Ihre besten Leistungen?  
To what extent do you feel motivated to contribute your best efforts to the organization's mission and tasks?

5. In welchem Ausmass gibt es Dinge in dieser Organisation (Leute, Verordnungen, oder Bedingungen) dass sie zu harter Arbeit anstrebt.  
To what extent are there things about this organization (people, policies or conditions) that encourage you to work hard?
6. In welchem Ausmass erhalten Sie Anerkennungen z.B. fuer extra schwere Leistungen?  
To what extent do people who work hard receive recognition (e.g. incentive awards)?
7. In welchem Ausmass ist Ihre Taetigkeit in Ihrer Arbeitsstelle organisiert?  
To what extent are work activities sensibly organized in your shop?
8. In welchem Ausmass gibt man Ihnen Zeit fuer Ihre Arbeitsauftraege zu beenden.  
To what extent is the workload and time available taken into consideration in planning your work group assignments?
9. Erkennen Leute in hoeherer Position Ihre Probleme in niedrigerer Position?  
People at higher levels of the organization are aware of the problems at your level.
10. In welchem Ausmass foerdert Ihr Vorgesetzter die Zusammenarbeit aller Mitarbeiter?  
To what extent does your supervisor encourage the members of your work group to work as a team?
11. In welchem Ausmass ermutigt Ihr Vorsteher Ihre Arbeitsgruppe fuer beste Leistungen?  
To what extent does your supervisor encourage the members of your work group to give their best effort?

sehr wenig  
To a very little extent  
etwas  
To a little extent  
etwas mehr  
To some extent  
viel mehr  
To a great extent  
sehr viel  
To a very great extent

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sehr wenig To a very little extent	eins To a little extent	etwas mehr To some extent	viel To a great extent	sehr viel To a great extent
---------------------------------------	----------------------------	------------------------------	---------------------------	--------------------------------

12. In welchem Ausmass erwartet Ihr Vorsteher hoechste Arbeitsansprueche von den Mitgliedern Ihrer Arbeitsgruppe?

To what extent does your supervisor expect high standards of performance from the members of your work group?

<input type="checkbox"/>				
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

13. In welchem Ausmass hilft Ihnen Ihr Vorsteher mit Ihren Arbeitsplaenen im Voraus?

To what extent does your supervisor help you plan, organize and schedule your work ahead of time?

<input type="checkbox"/>				
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

14. Hilft Ihnen Ihr Vorsteher mit Ideen, Arbeitsprobleme zu loesen?

To what extent does your supervisor offer you ideas to help solve job-related problems?

<input type="checkbox"/>				
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

15. In welchem Ausmass, wechseln Sie Ideen und Meinungen mit Mitgliedern Ihrer Arbeitsgruppe?

To what extent do members of your work group exchange opinions and ideas?

<input type="checkbox"/>				
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

16. Wie viele Mitglieder in Ihrer Arbeitsgruppe foerdern Zusammenarbeit als ein Team?

How much do members of your work group encourage each other to work as a team?

<input type="checkbox"/>				
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17. In welchem Ausmass behalten Mitglieder in Ihrer Arbeitsgruppe hohe Ansprueche in Verrichtung der Arbeit?

To what extent do members of your work group maintain high standards of performance?

<input type="checkbox"/>				
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18. In welchem Ausmass helfen sich Mitglieder in Ihrer Arbeitsgruppe untereinander, mit Ideen um Arbeitsprobleme zu loesen?

To what extent do members of your work group offer each other ideas for solving job-related problems?

<input type="checkbox"/>				
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

sehr wenig  
To a very little extent  
etwas  
To a little extent  
etwas mehr  
To some extent  
viel mehr  
To a great extent  
sehr viel  
To a very great extent

19. In welchem Ausmass plant und koordiniert Ihre Arbeitsgruppe Ihre Bemuehungen?  
To what extent does your work group plan together and coordinate its efforts?

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20. In welchem Ausmass haben Sie Vertrauen zu den Mitgliedern in Ihrer Arbeitsgruppe?  
To what extent do you have confidence and trust in the members of your work group?

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21. In welchem Ausmass besprechen Sie wichtige Informationen und Ereignisse mit Ihren Arbeitskollegen.  
To what extent is information about important job related events exchanged within your work group?

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22. In welchem Ausmass trifft Ihre Arbeitsgruppe gute Entscheidungen und loest Probleme?  
To what extent does your work group make good decisions and solve problems effectively?

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23. In welchem Ausmass ist Ihre Arbeitsgruppe fuer Notfaelle geschult.  
To what extent has your work group been adequately trained to handle emergency situations?

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24. In welchem Ausmass hat Arbeitspersonal Einfluss in Ihrer Arbeitsgruppe?  
To what extent do non-supervisory personnel influence what goes on in your work group?

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EXHIBIT VII-5  
(continued)

nicht zufrieden  
Very dissatisfied

eher unzufrieden  
Somewhat dissatisfied

nicht befriedigt oder unzufrieden  
Neither satisfied nor dissatisfied

eher befriedigt  
Fairly satisfied

sehr befriedigt  
Very satisfied

25. Alles in Allem, sind Sie zufrieden mit den Leuten in Ihrer Arbeitsgruppe?  
All in all, how satisfied are you with the people in your work group?

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26. Alles in Allem, sind Sie zufrieden mit Ihrem Vorsteher?  
All in all, how satisfied are you with your supervisor?

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27. Alles in Allem, sind Sie zufrieden mit Ihrer Organisation?  
All in all, how satisfied are you with this organization?

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28. Alles in Allem, sind Sie zufrieden mit Ihrer Arbeitsstelle?  
All in all, how satisfied are you with your job?

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Nachtraegliche Information. Bitte machen Sie ein Kreuz fuer die meist passende Antwort.  
Check the one response you feel is most appropriate.

29. Im allgemeinen, glauben sie die Materialversorgung ist:  
In general, do you think the supply support provided is:

VORTREFFLICH EXCELLENT	GUT GOOD	FAIR FAIR	DUERFTIG POOR	SEHR DUERFTIG VERY POOR
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30. Im allgemeinen, glauben Sie die Berechnungen fuer Ihre Arbeitsplaene sind:  
In general, do you feel the planning and estimating for your job assignments are:

UNTERSCHAETZT UNDERESTIMATED	UEBERSCHAETZT OVERESTIMATED	RICHTIG ARE ACCURATE	WEISS NICHT I DON'T KNOW
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31. Stehen angemessene Fahrzeuge zu Ihrer Verfuegung fuer Ihre Arbeitsstelle?  
Are vehicle assignments adequate for your shop?

JA YES	NEIN NO	WEISS NICHT I DON'T KNOW
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

32. Die Einrichtungen und Werkzeuge die von der Regierung zur Verfuegung stehen sind:  
The equipment and tools provided by the Government are:

VORTREFFLICH EXCELLENT	GUT SATISFACTORY	FAIR POOR	DUERFTIG UNSATISFACTORY
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

33. Fuer die Arbeit die Sie verrichten glauben Sie, sie sind:  
For the work you do, do you feel you are:

GUT BEZAHLT PAID FAIRLY	UNTERBEZAHLT UNDERPAID	UEBERBEZAHLT OVERPAID	WEISS NICHT DON'T KNOW
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34. Wenn Sie Material abholen fuer IJO, finden Sie, das Material ist:  
When going to pick up material for an IJO, you find the material is:

IMMER ZUERHALTEN  
ALWAYS THERE

GEWOEHNLICH ZUERHALTEN  
USUALLY THERE

GEOEHNLICH NICHT ZU ERHALTEN  
USUALLY NOT THERE

NIEMALS ZU ERHALTEN  
NEVER THERE

35. Arbeit ist unterbrochen, wegen nicht zu habenes Material:  
Work is interrupted due to nonavailability of material:

SEHR OFT  
OFTEN

NICHT OFT  
HALF THE TIME

SELTEN  
SELDOM

NIEMALS  
NEVER

36. Im allgemeinen, glauben Sie, sie sind:  
In general, do you feel you are:

UEBERARBEITET  
OVERWORKED

NICHT UEBERARBEITET  
UNDERWORKED

KEIN VON BEIDEN  
NEITHER

WEISS NICHT  
DON'T KNOW

37. Wie oft kommt Ihr Vorarbeiter zu Ihrer Arbeitsstelle?  
How often does your foreman visit you at the job site?

EINMAL AM TAG  
ONCE A DAY

MEHRERE MALE AM TAG  
MORE THAN ONCE A DAY

EINMAL IN DER WOCHE  
ONCE A WEEK

SELTEN  
SELDOM

Anmerkung:

Additional Comments:

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Streiche die folgenden Punkte im Original und ersetze sie durch die entsprechenden Überarbeitungen dieses Anhanges.  
Substitute the following on the attached Questionnaire

Streiche: Vorsteher - Setze anstatt: Vorgesetzter  
Wherever the word "Vorsteher" appears substitute "Vorgesetzter"

Zu Frage Nr. 3  
To Question # 3

Werden Sie nach Ihrer Meinung gefragt, wenn Entscheidungen und Veränderungen bevorstehen welche Sie persönlich betreffen?

To what extent are you asked for your opinion when decisions are being made that will affect you?

Zu Frage Nr. 4  
To Question # 4

In welchem Ausmass fühlen Sie sich angeregt oder verpflichtet Ihr Bestes zu leisten wenn es darum geht der Dienststelle bei der Bewältigung ihrer mannigfaltigen Aufgaben und Dienstleistungen zu helfen?

To what extent do you feel motivated to contribute your best efforts to the organization's mission and tasks?

Zu Frage Nr. 5  
To Question # 5

Gibt es auf dieser Dienststelle einen Anreiz (Vorgesetzte, Mitarbeiter, Kameraden oder Richtlinien, sowie Arbeitsbedingungen) der Sie persönlich anspornen kann auch mal schwere Arbeit oder unter Leistungsdruck Arbeit zu verrichten?

To what extent are there things about this organization (people, policies or conditions) that encourage you to work hard?

Zu Frage Nr. 9  
To Question # 9

Wissen Leute in führender, höherer Position Bescheid über die Probleme in Ihrer ausführenden, untergeordneten Position und über Probleme aus Ihrem Arbeitsbereich?

People at higher levels of the organization are aware of the problems at your level?

**EXHIBIT VII-5  
(continued)**

Zu Frage Nr. 16  
To Question # 16

Gibt es in Ihrer Arbeitsgruppe Mitarbeiter die als Vorbild gelten und welche die Zusammenarbeit und den Zusammenhalt als Arbeitsgruppe fördern?

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How much do members of your work group encourage each other to work as a team?

Zu Frage Nr. 17  
To Question # 17

In welchem Ausmass führen Mitarbeiter Ihrer Arbeitsgruppe überdurchschnittlich (d.h. über dem Standard liegend) hohe Leistungen in der Ausführung der Aufgaben durch?

---

To what extent do members of your work group maintain high standards of performance?

Zu Frage Nr. 24  
To Question # 24

In welcher Größenordnung bestimmen Mitarbeiter, die nicht Vorgesetzte sind, was in der Arbeitsgruppe vorgeht und gemacht wird?

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To what extent do non-supervisory personnel influence what goes on in your work-group?

Zu Frage Nr. 26  
To Question # 26

Alles in Allem, sind Sie mit Ihrem Vorgesetzten zufrieden?

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All in all, how satisfied are you with your supervisor?

**END**

**FILMED**

**4-85**

**DTIC**